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**STRUCTURED ANALYSIS/DESIGN**

**LSA TASK 303  
EVALUATION OF ALTERNATIVES AND  
TRADE-OFF ANALYSIS**

**SUBTASK 303.2.4  
SENSITIVITY OF SYSTEM READINESS**

**APJ 966-246**

APJ



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**STRUCTURED ANALYSIS/DESIGN**

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**LSA TASK 303**

**EVALUATION OF ALTERNATIVES  
AND TRADE-OFF ANALYSIS**

**SUBTASK 303.2.4**

**SENSITIVITY OF SYSTEM READINESS**

**under**

**CONTRACT DAAA21-86-D-0025**

**for**

**HQ US AMCCOM**

**INTEGRATED LOGISTIC SUPPORT OFFICE  
AMSMC-LSP  
ROCK ISLAND, IL**

**by**

**AMERICAN POWER JET COMPANY**

**RIDGEFIELD, NJ**

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19. ABSTRACT (Continue on reverse if necessary and identify by block number) This report consolidates the Structured Analysis and Structured Design for the Logistic Support Analysis (LSA) Tasks. Included are the Data Flow Diagrams (DFDs) for LSA Subtask 303.2.4, "Sensitivity of System Readiness", with the corresponding descriptions of the processes, data flows, data stores, and external entities identified on each DFD. The DFDs are further developed into procedures which identifies how to use the data to carry out the processes and accomplish the LSA Subtask. Venture Evaluation Review Technique (VERT) Batch Input files are also provided to assist, as tools, giving both technical and managerial aspects of a task.								
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PROCESS FLOWS, OVERALL SYSTEMS DEVELOPMENT PROCESS, AND SENSITIVITY  
OF SYSTEM READINESS.

## FOREWORD

APJ, under contract to HQs, AMCCOM, has initiated the automation of the LSA Tasks (MIL-STD-1388-1) and the assessment of the ILS elements (AR 700-127). A major goal is to unify military and contractor approach to the performance of ILS and LSA.

Detailed to meet all requirements of ILS and LSA, the automated process will continue to provide full flexibility in selecting tasks and elements to be addressed at each life cycle stage. At the same time it will insure that the application of each task element is consistent with prescribed Army policies and procedures.

This report consolidates the Structured Analysis and Structured Design under one cover for the respective LSA Tasks. Structured Analysis provides a logical model of the method to perform an LSA Task. This logical model facilitates the development of a Structured Design that provides the detailed procedures to perform the analysis. Both the logical model and detailed procedures are used to develop the application software programs which will be provided to Government and contractor personnel to assist in the performance of the LSA Task.

Included in this report are the Data Flow Diagrams (DFDs) for LSA Subtask 303.2.4, "Sensitivity of System Readiness" and the corresponding descriptions of the processes, data flows, data stores, and external entities identified on each DFD (Annex B). In addition the DFDs are further developed into step by step procedures (Annex C) which identifies how to use the data to carry out the processes which ultimately lead to accomplishing the LSA Subtask.

To assist managers in planning and controlling this task, Venture Evaluation Review Technique (VERT) Batch Input Files are provided (Annex D). These VERT tools provide government agencies with complete packages to give contractors that cover both technical and managerial aspects of a task. This approach establishes a standardized form of communication and management between contractors performing the task and government personnel reviewing the task.

To view this work in context, Annex E of this report also presents a brief overview of Structured Analysis and its place in the overall systems development process. The overview and certain portions of the introductory text are repeated verbatim in every report in this series so that each report is free standing.

## TABLE OF CONTENTS

<u>TITLE</u>	<u>PAGE</u>
Purpose.....	1
Background.....	1
Scope.....	1
LSA Subtask 303.2.4 Description.....	2
Approach.....	3
LSA Subtask 303.2.4 - Survivability & Battlefield Damage.....	3
VERT Diagrams.....	5
ANNEX A:	
LSA Task 303 Description Evaluation of Alternatives and Trade-Off Analysis.....	A-1
ANNEX B:	
LSA Subtask 303.2.4 - Survivability & Battlefield Damage, Data Flow Diagrams and Data Dictionary.....	B-1
ANNEX C:	
LSA Subtask 303.2.4 Survivability & Battlefield Damage Structured Design.....	C-1
ANNEX D:	
LSA Subtask 303.2.4 VERT Batch Input Files.....	D-1
ANNEX E:	
Structured Systems Analysis - Fundamentals.....	E-1

## LIST OF TABLES & FIGURES

<u>FIGURE NO.</u>	<u>TITLE</u>	<u>PAGE</u>
1	Elements Impacted by Trade-Off Analysis.....	C-12
2	Trade-Off Relationships Between ILS Elements.....	C-13
3	Structured Analysis and Structured Systems Design Organization.....	E-5
4	Standard DFD Symbol Definitions.....	E-6

## INTRODUCTION

### PURPOSE

The purpose of this report series is to present the results of the APJ Structured Analysis/Design under Contract DAAA21-86-D-0025 for coordination with the AMCCOM Program Manager prior to in-depth programming of ILS and LSA functions and processes. LSA Task 303 "Evaluation of Alternatives & Trade-Off Analysis", ("LSA Subtask 303.2.4, "Sensitivity of System Readiness") is addressed in this report.

### BACKGROUND

The Department of the Army has a requirement for management control over contractor and Government agency response to the requirements of AR 700-127, "Integrated Logistic Support", and MIL-STD-1388-1, "Logistic Support Analysis". HQs AMCCOM has initiated action to structure each of the LSA tasks, the assessment of each ILS element, the form of the results, and the detailed processes to insure consistency with current Army policies, procedures, and techniques.

This approach (undertaken by AMCCOM and APJ) will insure uniformity in efforts and products, reproducibility of analyses, and a well-defined structure which can be coordinated among all participants in the logistic process to arrive at common understanding and procedures.

### SCOPE

This report summarizes the results of the Structured Analysis of the identification of LSA Task 303, "Evaluation of Alternatives & Trade-Off Analysis", LSA Subtask 303.2.4, "Sensitivity of System Readiness", and presents the associated Data Flow Diagrams (DFDs) developed from the Structured Analysis and the corresponding procedures developed in the Structured Design. The portions of the Data Dictionary relating to the DFDs for this LSA Subtask includes the labels, names, descriptions, processes, data flows, data stores, and external entities. (The Data Dictionary is a "living document" that evolves through the analysis and design process).

The Data Dictionaries developed for each of the individual LSA Subtasks are integrated together into a Master Data dictionary. Integration of the individual Data dictionary involves the combination of similar Data Flows, Data Stores, and

External Entities. The resulting master Data Dictionary may well contain some minor differences from the definitions that appear in this report. All processes, and of course, the content of the structured design will remain identical.

The Structured Design portion of this report develops the processes and data flows from the DFDs into procedures which are used to accomplish the LSA Tasks. The DFDs provide the method and the Design implements it, by formulating a guide for programmers to write software applications.

This report presents a brief overview of Structured Analysis and its place in the overall systems design process to assist the reader who may not be fully briefed on the symbols and conventions used. It is supported by Annex E, which defines each element in Structured Analysis.

#### LSA SUBTASK 303.2.4 DESCRIPTION

The "Sensitivity Analysis" examines the effects of changing cost, schedule, design and support parameters, based on the results of various trade-off analyses, on selected alternative system equipment readiness requirements.

The Trade-Off Analysis determined the acceptable high-low range and optimum factor for each of the analyzed ILS element drivers. It also stipulated which of these drives were the high or most sensitive ones because the driver caused a change in cost, schedule or support. Using these results as a base, the high drives are again processed through the models used in the Trade-Off Analysis (keeping the readiness factors constant), to determine their affect on other systems drivers. The factors varied must always remain within the ranges stipulated by the Trade-Off Analysis.

After finding acceptable outerbounds for each factor processed, a new model is developed based upon the interaction of these factors. This time, the high drive is tested with readiness as a variable while holding other affected drivers constant. This analysis will determine the sensitivity of readiness to the acceptable outerbounds for each driver. When testing is completed, assessments are documented and the necessary reports updated.

The LSA Task Description with associated task inputs and outputs is extracted from MIL-STD-1388-1A and is included as Annex A.



## APPROACH

The APJ approach to Structured Analysis and Structured Design of an LSA Subtask is:

1. Scope the Subtask defined in MIL-STD-1388-1A with the overall task and determine its relationship with other LSA Tasks.
2. Review all pertinent documentation (e.g., ARs, MIL-STDs, etc.) applicable to the specific topic.
3. Prepare the Top Level DFDs in context of the Subtask, and develop lower level DFDs to further quantify any complex process identified in the top level DFD.
4. Complete the Data Dictionary portion of the Analysis by describing all processes, data flows, data stores and external entities.
5. Apply staff experience in logistic support analysis to assure that the topic has been exhaustively addressed.
6. From the completed DFDs, prepare the step-by-step procedures that form the structured design.
7. Review Data Item Description and other applicable material to develop output reports.
8. If required, revise DFDs and Data Dictionary based on preparation of detailed procedures.
9. Validate results in discussions with Army activities and personnel directly involved in the applicable or related LSA tasks.

NOTE: Structured Analysis and preparation of Data Flow Diagrams (DFDs) was further assisted by the application of Structured Analysis software. Licensed by Index Technology Corporation, Excelerator provides for automated tracking of names, labels, descriptions, multiple levels of detail in the data flow diagrams, and industry standards in symbols and diagramming practices.

### LSA SUBTASK 303.2.4 - SENSITIVITY OF SYSTEM READINESS

The Data Flow Diagram is a tool that shows the flow of data, (i.e., data flows from sources) and is processed by activities to produce intermediate or final products.

The DFD provides a useful and meaningful partitioning of a system from the viewpoint of identification and separation of all functions, actions, or processes so that each can be introduced, changed, added, or deleted with minimal disruption of the overall program, i.e., it emphasizes the underlying concept of modularity and identifiable transformations of data into actionable products.

A series of two (2) DFDs have been developed to structure the LSA subtask relative to operations and other support functions:

1. 303.2.4 Combined Sensitivity Analysis
2. 303.2.4.1A Individual Sensitivity Analysis

Each DFD is keyed to the specific task through the identification number assigned in the lower right hand box. The Alpha codes indicate the level of indenture or explosion below the top level, i.e.,:

Top Level.....LSA DFD 303.2.4  
First Indenture.....LSA DFD 303.2.4.1A

Each DFD makes reference to the basic LSA task it addresses, as well as the level of indenture (explosion) of the DFD. For example, the first or top level DFD, "303.2.4", refers to the section in MIL-STD-1388-1A which describes the review items. One of the processes (bubbles) on the top level diagram (303.2.4.1) is expanded and identified as "303.2.4.1A".

Four standard symbols are used in the drawing of a DFD (see Annex E - Figure 1).

A copy of each DFD is presented in Annex B, accompanied by the Data Dictionary process elements. Each entry made in the DFDs has a corresponding entry in the Data Dictionary.

This presents only those Data Dictionary entries necessary for the coordination of the overall concept and details of the processes. To facilitate review of the diagrams, data flow identifications, process, an data store descriptions are provided. As noted above, they will continue to evolve and be expanded in the System Design phase.

## VERT DIAGRAMS

The Venture Evaluation Review Technique (VERT) was developed as a network analysis technique to facilitate management decision making. It allows systematic planning and control of the program and enables managers to find solutions to real life managerial problems. The VERT Diagrams and Batch Input Files for this task can be found in Annex D. In order to understand how these Input Files were developed, a brief discussion of the methodology used is provided. The same explanation is repeated verbatim in every report.

## **ANNEX A**

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### **LSA TASK 303 DESCRIPTION EVALUATION OF ALTERNATIVES AND TRADE-OFF ANALYSIS**

ANNEX A  
LSA TASK 303  
**EVALUATION OF ALTERNATIVES AND TRADE-OFF ANALYSIS 1/**

303.1 PURPOSE. To determine the preferred support system alternative(s) for each system/equipment alternative and to participate in alternative system trade-offs to determine the best approach (support, design, and operation) which satisfies the need with the best balance between cost, schedule, performance, readiness and supportability.

303.2 TASK DESCRIPTION

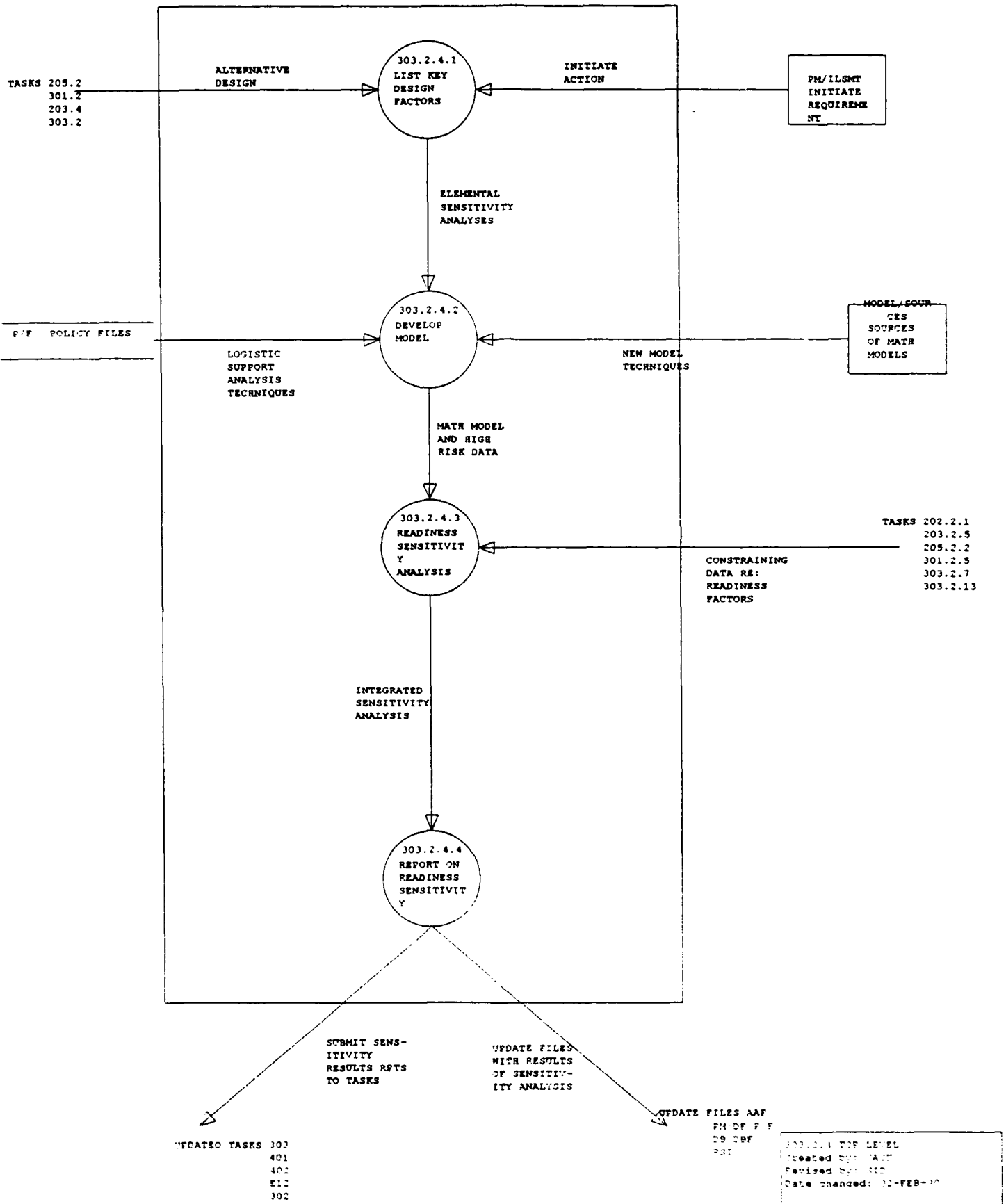
303.2.4 Evaluate the sensitivity of system readiness parameters to variations in key design and support parameters such as R&M, spares, budgets, resupply time, and manpower and personnel skill availability.

1/ Abstracted verbatim from MIL-STD-1388-1A, April 11, 1983, Pages 36 & 37.

## **ANNEX B**

### **SUBTASK 303.2.4**

#### **READINESS SENSITIVITY ANALYSIS, DATA FLOW DIAGRAMS AND PROCESS DATA DICTIONARY**







DATE: 2-FEB-90  
TIME: 10:49

APJ 966 - 246  
PROCESSES

PAGE 1  
EXCELEATOR 1.84

Name	Label	Description
303.2.4.1	LIST KEY DESIGN FACTORS	LIST THOSE KEY FACTORS (HIGH DRIVERS) OF THE ILS ELEMENTS (ie R&M, SUPPLY SUPPORT, SUPPORT EQUIPMENT, SUPPORT FACILITIES, COST ANALYSIS & FUNDING, TRANSPORTATION & TRANSPORTABILITY, TRAINING & TRAINING DEVICES, MANPOWER AND PERSONNEL SKILLS AVAILABILITY) THAT BECAUSE OF THEIR REQUIREMENTS (HIGH VOLUMES, USAGE RATES, TIMES ASSOCIATED WITH THE COMPLETION OF THEIR MISSIONS, EQUIPMENTS WITH SPECIAL REQUIREMENTS) ARE PRONE TO VARIATIONS AND MAY CAUSE PROBLEMS WHICH CAN AFFECT THE ELEMENTS' STATED READINESS GOALS OF THE SELECTED SYSTEM./EQUIPMENT. THESE FACTORS WILL PROVIDE THE BASIS FOR A COMBINED SENSITIVITY ANALYSIS. THIS PROCESS WILL ENSURE THAT THE FACTORS ARE SEGREGATED BY LEVEL WITHIN ELEMENT.
303.2.4.1a1	SELECT PARAMETERS	THIS PROCESS REORGANIZES THE HIGH DRIVER FACTORS OF THE STANDARDIZATION STANDARD/N & INTEROPERABILITY ILS ELEMENT WITHIN DESIGN AND SUPPORT BY HIGHEST RISK /INTEROP'Y IN DESCENDING ORDER FOR THIS ALTERNATIVE SELECTION. THESE FACTORS INCLUDE , BUT ARE NOT LIMITED TO COMPATIBILITY OF COMPONENTS AND PARTS, INTERCHANGEABILITY, ETC. THESE TOGETHER WITH THE MODELS (MATHEMATICAL &/OR MANUAL) THAT WERE USED IN THE TRADE-OFF ANALYSIS TO SELECT THIS ALTERNATIVE WILL PROVIDE THE BASIS FOR THE STANDARDIZATION & INTEROPERABILITY INDIVIDUAL SENSITIVITY ANALYSIS.
303.2.4.1a10	INDIVIDUAL SENSITIVIT Y ANALYSIS	THIS PROCESS PROVIDES FOR THE ANALYSES OF EACH ILS ELEMENT AND THE SENSITIVITY OF THE HIGH DRIVERS WITHIN IT TO CHANGE AND STILL MEET THE READINESS OBJECTIVES OF THE SYSTEM/EQUIPMENT. ONLY THOSE DRIVERS THAT WERE DETERMINED TO IMPACT THE SELECTED SYSTEM/EQUIPMENT READINESS TO A HIGH DEGREE WILL BE USED. THE MATHEMATICAL AND/OR MANUAL MODELS USED IN THE ALTERNATIVES TRADE-OFF DECISION WILL BE ALSO USED. THE VARIABLES MAY BE DUE TO FAILURES, TIME LAPSES, DISTANCES, ETC. AND CHANGE UP TO THE POINT, BUT NOT INCLUDING, WHEN THE READINESS GOAL FALLS BELOW ITS STATED OBJECTIVE. THE DOCUMENTATION COVERING THIS ANALYSIS MUST INCLUDE OTHER AFFECTED ELEMENTS TO ESTABLISH THE INTERRELATIONSHIPS BETWEEN FACTORS. 1. REVIEW THE DOCUMENTATION FROM THE SPECIFIC ILS ELEMENT DATA FLOW. 2. PREPARE THE MATHEMATICAL MODEL FOR USE. 3. FOR DESIGN (THEN FOR SUPPORT), TAKE EACH IDENTIFIED VARIABLE AND VARY ITS FACTORS IN A CONTINUING WORSENING CONDITION UNTIL THE MODEL INDICATES THAT THE READINESS HAS FALLEN BENEATH THE MISSIONS STATED OBJECTIVES FOR THIS ILS ELEMENT. 4. RECORD THE OUTSIDE BOUND FOR THIS SELECTION AND IT EFFECT ON COST. 5. ASSESS AND RECORD ITS IMPACT ON OTHER ILS ELEMENTS. 6. CONTINUE UNTIL ALL THE DRIVERS LISTED HAVE BEEN PROCESSED.

DATE: 2-FEB-90  
TIME: 10:49

APJ 966 - 246  
PROCESSES

PAGE 2  
EXCELERATOR 1.84

Name	Label	Description
303.2.4.1A2	SELECT REL/MAINT PARAMETERS	THIS PROCESS REORGANIZES THE HIGH DRIVER FACTORS OF THE RELIABILITY AND MAINTAINABILITY ILS ELEMENT TOGETHER WITH ANY MATHEMATICAL AND/OR MANUAL MODELS WERE USED IN THE TRADE-OFF ANALYSIS TO SELECT THIS ALTERNATIVE SYSTEM/EQUIPMENT. THE FACTORS WILL BE ORGANIZED BY TYPE (SEE THE "SENSITIVITY ANALYSIS" FORM) INTO THE LEVELS OF SUPPORT REQUIRED FOR THE MISSION FUNCTIONS WITH THE HIGHEST DRIVERS FACTORS BEING FIRST. THE FACTORS THAT THESE ELEMENTS WILL AFFECT FOR MAINTAINABILITY ARE MTBM, MTBMA, MTBR+, MTBUM, MTTR, ETC. THOSE FOR RELIABILITY ARE MTBCF, MTBF, MTBFF, ETC. OTHER ITEMS TO CONSIDER ARE; EASE OF ACCESSABILITY, SAFETY CHARACTERISTICS, STANDARDIZATION, INHERENT SIMPLICITY, SELF TEST CAPABILITY, ENVIRONMENTAL CONDITIONS, REDUNDANCY, COMPATIBILITY OF COMPONENTS AND PARTS, ETC.
303.2.4.1A3	SEL SUPPRT EQUIPMNT & FACILITIES FACTORS	THIS PROCESS WILL REORGANIZE THE HIGH DRIVERS FACTORS OF THE SUPPORT EQUIPMENT & EQUIPMENT ILS ELEMENT WITHIN DESIGN AND SUPPORT TOGETHER WITH ANY MODELS (MATHEMATICAL &/OR MANUAL) THAT WERE USED IN THE TRADE-OFF ANALYSIS TO ARRIVE AT THE DECISION TO SELECT THIS ALTERNATIVE. THE FACTORS WILL BE SEQUENCED IN DESCENDING ORDER FROM THE HIGHEST RISK DOWNWARD. FACTORS TO BE CONSIDERED INCLUDE, BUT ARE NOT LIMITED TO; TEST/MEASUREMENT/DIAGNOSTIC/CALIBRATION/RECOVERY/EVACUATION EQUIPMENT AND PROCEDURES FOR THEIR USE, BOIP, GENERATORS, VEHICLES, TOOLS/KITS, SYSTEM MAJOR COMPONENTS, INSTALLATION UNITS AND MANPRINT CONSIDERATIONS.
303.2.4.1A4	SELECT MANPOWER & PERSONNEL SKILL AVAI L FACTORS	THIS PROCESS WILL REORGANIZE THE HIGH DRIVER FACTORS OF THE MANPOWER & MANPOWER/PERSONNEL SKILLS AVAILABILITY ILS ELEMENT WITHIN DESIGN AND SUPPORT TOGETHER WITH THE MODELS (MATHEMATICAL &/OR MANUAL) THAT WERE USED IN THE TRADE-OFF ANALYSIS TO SELECT THIS SYSTEM/EQUIPMENT ALTERNATIVE. FACTORS TO CONSIDER ARE; PROJECTED WORKLOADS, NUMBER OF PERSONNEL ALLOCATED TO EACH FUNCTIONAL AREA, MOS SCHOOL OUTPUT, NEW AND UNIQUE SKILLS THAT ARE REQUIRED, ETC.
303.2.4.1A5	SELECT SUPPLY SUPPORT PARAMETERS	THIS PROCESS WILL REORGANIZE THE HIGH DRIVER FACTORS OF THE SUPPLY SUPPORT ILS ELEMENT BY TYPE (SEE "SENSITIVITY ANALYSIS" FORM) TOGETHER WITH THE MATHEMATICAL AND/OR MANUAL MODELS THAT WERE USED IN THE TRADE-OFF ANALYSIS TO SELECT THIS SYSTEM/EQUIPMENT ALTERNATIVE. FACTORS TO BE CONSIDERED ARE FAILURES, REPAIR OR DISCARD, SESAME CRITERIA, DISTANCE, TIME AND RESOURCES EXPENDED, FIXED AND/OR MOBILE FACILITIES, POL, CONSUMABLES RATE OF USE, STORAGE, HANDLING AND LIFTING EQUIPMENT, SECURITY REQUIREMENTS, WARTIME RESERVES, STOCKS, SETS/KITS/OUTFITS, CONSIDERATION FOR RADIOACTIVE MATERIELS AND THEIR SUPPORT EQUIPMENT, ETC.

DATE: 2-FEB-90  
TIME: 10:49

APJ 966 - 246  
PROCESSES

PAGE 3  
EXCELERATOR 1.84

Name	Label	Description
303.2.4.1A6	SELECT COST ANALYSIS & FUNDING FACTORS	THIS PROCESS WILL REORGANIZE THE KEY HIGH DRIVERS FACTORS OF THE COST ANALYSIS AND FUNDING ILS ELEMENT UNDER DESIGN AND SUPPORT TOGETHER WITH THE RELEVANT MODELS (MATHEMATICAL &/OR MANUAL) THAT WERE USED IN THE TRADE-OFF ANALYSIS TO ESTABLISH THAT THIS SYSTEM EQUIPMENT FALLS WITHIN THE OBJECTIVES OF THE STATED READINESS GOALS. THESE FACTORS INCLUDE BUT ARE NOT LIMITED TO; O&S/PROVISIONING/ TOOLS/SUPPORT EQUIPMENT /PUBLICATION/PRINTING/ TRANSPORTATION/ETC. COSTS, WARRANTIES, TECHNICAL ASSISTANCE, TRAINING, LOGISTIC SUPPORT, SECONDARY STOCK PARTS, EXPENDABLES, FACILITIES, TESTING, PDSS, RESOURCES MANAGEMENT, COEA, ESTIMATES & CONSTRAINTS.
303.2.4.1A7	SEL SUPPRT FACILITIES	THIS PROCESS WILL REORGANIZE THE HIGH DRIVER FACTORS OF TTHE SUPPORT FACILITIES ILS ELEMENT WITHIN DESIGN AND SUPPORT, TOGETHER WITH ANY MODELS (MATHEMATICAL OR MANUAL) THAT WERE USED IN THE TRADE-OFF ANBALYSIS TO ARRIVE AT THE DECISION TO SELECT THIS ALTENATIVE. THE FACTORS WILL BE SEQUENCED IN DESCENDING ORDER FROM THE HIGHEST RISK DOWNWARD. FACTORS TO BE CONSIDERED ARE MOBILE/FIXED/TRAINING/DEPOT/TESTING/ SPECIAL/MAINTENANCE AND STORAGE FACILITIES. (SEE DA PAM 700-28, PARAGRAPH 4-35)
303.2.4.1A8	SELECT TRAINING & TRAINING DEVICE FACTORS	THIS PROCESS GATHERS THE HIGH DRIVER (KEY) FACTORS OF THE TRAINING AND TRAINING DEVICES ILS ELEMENT AND ORGANIZES THEM UNDER DESIGN AND THEN SUPPORT TOGETHER WITH THE RELEVANT MODELS (MATHEMATICAL &/OR MANUAL) THAT WERE USED IN THE TRADE-OFF ANALYSIS TO SELECT THIS ALTERNATIVE SYSTEM/EQUIPMENT AS FALLING WITHIN THE MISSION'S STATED READINESS GOALS. THESE FACTORS INCLUDE BUT ARE NOT LIMITED TO; THE TRAINING PLAN, FACTORY & RESIDENT SCHOOL TRAINING, INSTRUCTOR AND PERSONNEL TRAINING, TRAINING MATERIELS/AIDS/DEVICES/EQUIPMENT/INSTRUCTIONS, USER/FIELD MANUALS, SKILL SPECIALTIES & DESIGNATIONS, AGREEMENTS, TESTS, EVALUATION PROGRAM AND JOINT SERVICE TRAINING.
303.2.4.1A9	SELECT TRANSPORT- ATION/TRAN SPORTABILI TY FACTORS	THIS PROCESS REORGANIZES THE HIGH DRIVER FACTORS OF THE TRANSPORTATION & TRANSPORTABILITY ILS ELEMENT WITHIN THE DESIGN AND SUPPORT PARAMETERS TOGETHER WITH THE MATHEMATICAL AND/OR MANUAL MODELS THAT WERE USED IN THE TRADE-OFF ANALYSIS TO SELECT THIS EQUIPMENT/SYSTEM ALTERNATIVE. FACTORS TO BE CONSIDERED INCLUDE, BUT ARE NOT LIMITED TO; TYPE OF TRANSPORT AND ITS LIMITATIONS, WIDTH/HEIGHT CONSTRAINTS, EQUIPMENT/CONTAINER COMPATIBILITY, AIRDROP/CUSTOMS/TRANSPORTATION CONFIGURATION LOADING/TMDE & SPECIAL TOOLS TRANSPORT REQUIREMENTS AND LIFTING AND TIEDOWN PROVISIONS.
303.2.4.2	DEVELOP MODEL	THIS PROCESS WILL REVIEW THE HIGH DRIVERS FACTORS AND THE MODELS THAT THEY WERE PROCESSED WITH, TOGETHER WITH ANY OTHER AVAILABLE MODELS IN ORDER TO DEVELOP A MULTI-VARIATE MODEL FOR COMBINING AND PROCESSING ALL THE DATA. THE MODEL THUS CREATED WILL BE USED IN THE NEXT PROCESS TO DETERMINE THE OUTSIDE BOUNDS THAT EACH OF THE HIGH DRIVER FACTORS CAN ACHIEVE WHEN COMBINED WITH THE OTHER FACTORS AND STILL MEET THE READINESS GOALS OF THIS ALTERNATIVE SYSTEM/EQUIPMENT.

DATE: 2-FEB-90  
TIME: 10:49

APJ 966 - 246  
PROCESSES

PAGE 4  
EXCELERATOR 1.84

Name	Label	Description
303.2.4.3	READINESS SENSITIVIT Y ANALYSIS	THIS PROCESS TAKES THE OUTER BOUND PARAMETERS OF ALL OF THE KEY (HIGH DRIVERS) FACTORS OF THE AFFECTED ILS ELEMENTS THAT WERE OBSERVED IN THE INDIVIDUAL SENSITIVITY ANALYSES AND USES THEM IN A COMBINED AND MULTIVARIATE MODEL ANALYSIS TO DETERMINE THE MOST EFFICACIOUS MIX FOR THIS SELECTED SYSTEM/EQUIPMENT ALTERNATIVE UNDER REVIEW THAT WILL MEET THE STATED READINESS OBJECTIVES.
303.2.4.4	REPORT ON READINESS SENSITIVIT Y	THIS PROCESS WILL FORMAT THE INFORMATION OBTAINED ON SYSTEM READINESS FOR UPDATING VARIOUS FILES FOR USE BY OTHER TASKS AND FOR REPORTING PURPOSES. IN THIS WAY, THE SYSTEM PREVIOUSLY EVALUATED WILL CONTINUE TO BE REFINED TO MEET PEACETIME AND WARTIME READINESS GOALS.

DATE: 2-FEB-90  
TIME: 10:51

APJ 966 - 246  
DATA FLOWS

PAGE 1  
EXCELERATOR 1.84

Name	Label	Description
ALT/DES	ALTERNATIVE DESIGN	<p>ACRONYMS:</p> <p>THIS DATA FLOW PROVIDES DATA RELATED TO ILS ELEMENTAL FACTORS USED IN ARRIVING AT THE DESIGN/SUPPORT ALTERNATIVES THAT WERE SELECTED FOR THIS SYSTEM/EQUIPMENT.</p> <p>THE SOURCE OF THE DATA IS TASK 303.2 - TRADE-OFF ANALYSIS, WHEREIN THE VARIOUS ALTERNATIVE SYSTEM/EQUIPMENTS WERE IDENTIFIED AND AND TESTED THROUGH MATHEMATICAL AND/OR MANUAL MODELS TO DETERMINE THE HIGH - LOW AND OPTIMUMS FOR EACH ELEMENT WITHIN THEM THAT WOULD STILL PROVIDE COST EFFECTIVE ACCEPTABLE LEVELS OF SYSTEM READINESS. OTHER TASKS PROVIDE ADDITIONAL SUPPORTIVE DATA FOR EACH SELECTION.</p>
BDGT/FCTRS	COST FACTORS	<p>ACRONYMS:</p> <p>PURPOSE: THIS DATA FLOW CARRIES THE REORGANIZED KEY HIGH DRIVER FACTORS OF THE COST ANALYSIS AND FUNDING ILS ELEMENT AND THE MODELS (MATHEMATICAL &amp;/OR MANUAL) THEY WERE PROCESSED THROUGH IN THE TRADE-OFF ANALYSIS TO ARRIVE AT THE SELECTION OF THIS SYSTEM/EQUIPMENT IN MEETING THE READINESS GOALS OF THIS ILS ELEMENT.</p>
CMBND/VAR	COMBINED VARIABLES	<p>ACRONYMS:</p> <p>PURPOSE: THIS DATA FLOW CARRIES THE RESULTS OF THE INDIVIDUAL SENSITIVITY ANALYSES. THESE ARE SPECIFIC ELEMENTAL PARAMETERS. THE OUTSIDE BOUNDS OF EACH OF THE HIGH RISK DRIVERS THAT WILL BE USED IN A COMBINED SENSITIVITY ANALYSIS (MULTI-VARIATE) MODEL TO DETERMINE HOW THE SYSTEM/EQUIPMENT READINESS OBJECTIVES WILL VARY AND AT WHAT POINTS THEY WILL FALL BELOW THE STATED GOALS.</p>
COST.FND/F	COST & FUNDING FACTORS	<p>ACRONYMS:</p> <p>PURPOSE: THIS DATA FLOW CARRIES THE HIGH DRIVER (KEY COST ANALYSIS AND FUNDING) FACTORS AND MODELS THAT WERE FROM THE TRADE-OFF ANALYSIS AND SHOWED THIS ALTERNATIVE SELECTION WOULD MEET THE STATED READINESS GOALS OF THIS ILS ELEMENT FOR THE SYSTEM/EQUIPMENT MISSION.</p>
ELE/SEN/ANAL	ELEMENTAL SENSITIVITY ANALYSES	<p>ACRONYMS:</p> <p>PURPOSE: THIS DATA FLOW CARRIES, FOR EACH ELEMENT, ALL THE INFORMATION REGARDING THE HIGH DRIVERS, ASSOCIATED FACTORS (HIGH, LOW OPTIMUM) AND MODELS USED IN THEIR DEVELOPMENT THAT WILL BE REQUIRED TO SELECT, REVIEW, ANALYZE AND DEVELOP THE SENSITIVITY OF EACH DRIVER TO AFFECT THE READINESS OF THE ELEMENT FOR THE SELECTED SYSTEM/EQUIPMENT ALTERNATIVE.</p>

DATE: 2-FEB-90  
TIME: 10:51

APJ 966 - 246  
DATA FLOWS

PAGE 2  
EXCELERATOR 1.84

Name	Label	Description
INIT/ACT	INITIATE ACTION	PURPOSE: DATA IDENTIFYING THE NEED FOR ASSESSING AN ALTERNATIVE SYSTEM/EQUIPMENT. THIS NEED MAY BE BASED ON AN EVALUATION OF THE EXISTING MANPOWER/PERSONNEL REQUIREMENTS ON THE BASELINE SYSTEM/EQUIPMENT. THIS DATA: 1. ESTABLISHES MISSION PROFILE. 2. IDENTIFIES THE RESOURCES THAT EXIST AND/OR MUST BE DEVELOPED 3. ESTABLISHES PRIORITIES. SOURCE OF DATA: PROGRAM MANAGER
INT/SENS/ANAL	INTEGRATED SENSITIVITY ANALYSIS	ACRONYMS: PURPOSE: THIS DATA FLOW CARRIES THE RESULTS OF THE COMBINED SENSITIVITY ANALYSIS PERFORMED IN TASK 303.2.4.3 FOR THE ALTERNATIVE SYSTEM/EQUIPMENT UNDER REVIEW. THIS DATA WILL BE FORMATTED FOR UPDATING TASKS AND FILES IN THE SYSTEM/EQUIPMENT SELECTION CYCLE.
MODEL/DATA	MATH MODEL AND HIGH RISK DATA	ACRONYMS: PURPOSE: THIS DATA FLOW CARRIES THE MODEL(S) CREATED FOR THE COMBINED SENSITIVITY ANALYSIS TOGETHER WITH THE DEVELOPED OUTSIDE BOUNDS FOR EACH HIGH DRIVER FACTOR FROM EACH OF THE ILS ELEMENTS THAT WILL BE PROCESSED THROUGH THE MODEL.
NEW/TECHIQS	NEW MODEL TECHNIQUES	ACRONYMS: PURPOSE: THIS DATA FLOW CARRIES THE LATEST TECHNIQUES AVAILABLE FROM OTHER SOURCES TO SUPPORT THE BUILDING OF THE REQUIRED SENSITIVITY MODEL. IT COULD PROVIDE THE MODEL ITSELF SHOULD THIS BE CONTRACTED FOR.
PAR/DATA	CONSTRAINING DATA RE: READINESS FACTORS	ACRONYMS: PURPOSE: THE DATA IN THIS FLOW IS USED TO PERFORM THE SENSITIVITY ANALYSIS AND CONTAINS DATA GATHERED FROM TASKS 202.2.1 (DESIGN CONSTRAINTS BASED ON COST, MANPOWER, PERSONNEL, READINESS OR SUPPORT) 203.2.5 (READINESS DRIVERS FOR EACH ILS ELEMENT) 203.2.5 (ILS ELEMENT SUPPORT COSTS AND READINESS OBJECTIVES) 301.2.5 (DESIGN ALTERNATIVES TO CORRECT DEFICIENCIES) 303.2.7 (INFORMATION REGARDING THE RLA CONDUCTED WITH AVAILABLE LEVEL OF DESIGN, OPERATION AND SUPPORT DATA AVAILABLE)
PERS/SENS/EVALS	SENSITIVITY OF PERSONNEL /MANPOWER SKILLS EVAL. DATA	ACRONYMS: PURPOSE: THIS DATA FLOW PROVIDES MANPOWER/SKILL INFORMATION REGARDING THE HIGH DRIVER FACTORS AND THE MODELS (MATHEMATICAL/MANUAL) THEY WERE PROCESSED WITH IN THE TRADE-OFF ANALYSIS THAT RESULTED IN THE SELECTION OF THIS SYSTEM/EQUIPMENT. THESE FACTORS WERE DEVELOPED IN THE MODEL FOR DESIGN AND SUPPORT AND INCLUDE THE QUANTITIES (NUMBERS OF) AND QUALITIES (SKILLS) OF PEOPLE WITH ASSOCIATED COSTS REQUIRED FOR EACH TASK FOR EACH FACTOR DOCUMENTED.

DATE: 2-FEB-90  
TIME: 10:51

APJ 966 - 246  
DATA FLOWS

PAGE 3  
EXCELERATOR 1.84

Name	Label	Description
PRSNL/FCTRS	PERSONNEL & SKILL FACTORS	ACRONYMS:  PURPOSE: THIS DATA FLOW CARRIES THE NECESSARY INFORMATION REQUIRED TO DETERMINE THE RANGE OF VARIABLES THAT WILL BE USED IN THE INDIVIDUAL SENSITIVITY ANALYSIS. THE RESULTS OF THIS ANALYSIS WILL ENABLE THE SELECTION OF VARIABLES FOR USE WITH OTHERS IN THE COMBINED ANALYSIS TO DETERMINE THE SENSITIVITY OF THE READINESS OBJECTIVES TO FAILURES, CHANGES, ETC.
R&M/DRIVERS	REL/MAINT HIGH DRIVERS	ACRONYMS:  PURPOSE: THIS DATA FLOW CARRIES THE HIGH DRIVER FACTORS WITH HIGH, LOW, OPTIMUM VALUES AND THE READINESS VALUE FOR THE OPTIMUM, TOGETHER WITH ANY MODEL FROM WHICH THEY RESULTED WHEN PROCESSING THE TRADE-OFF ANALYSIS FOR THIS ELEMENT.
R&M/FCTRS	REL/MAINT FACTORS	ACRONYMS:  PURPOSE: THIS DATA FLOW CONTAINS INFORMATION CONCERNING THE RELIABILITY AND MAINTAINABILITY HIGH DRIVER FACTORS AND MODELS (MATHEMATICAL AND MANUAL) THAT WILL BE USED IN THE INDIVIDUAL SENSITIVITY ANALYSES. THESE ANALYSES WILL DETERMINE AT WHAT POINTS THE READINESS OBJECTIVES FALL BELOW THEIR STATED GOALS.
RPT/SENS/TSKS	SUBMIT SENS- ITIVITY RESULTS RPTS TO TASKS	ACRONYMS:  PURPOSE: THIS DATA FLOW CARRIES THE RESULTS OF THE INTEGRATED SENSITIVITY ANALYSIS TO THOSE TASKS THAT WILL USE THIS INFORMATION TO FURTHER REFINE THE CONSTRAINTS ON THE FACTORS USED.
S&I/DTA	STANDARDIZA TION & INTER OPERABILITY DATA	ACRONYMS:  PURPOSE: THIS DATA FLOW CARRIES THE HIGH DRIVER FACTORS (HIGH, LOW, OPTIMUM) AND ANY MODELS (MATHEMATICAL AND/OR MANUAL) THAT WERE USED IN DEVELOPING THE S&I PARAMETERS UPON WHICH THIS ALTERNATIVE SYSTEM/EQUIPMENT WAS SELECTED. ITEMS TO BE CONSIDERED ARE PERCENT OF S&I INCLUDED, INTERCHANGEABILITY, AND THE USE OF PROVEN COMPONENTS AND SUBSYSTEMS.
S&I/FACTORS	STANDARDIZA TION & INTER OPERABILITY FACTORS	ACRONYMS:  PURPOSE: THIS DATA FLOW CARRIES THE REORGANIZED HIGH DRIVER (KEY) FACTORS OF THE ILS ELEMENT STANDARDIZATION & INTEROPERABILITY THAT INCLUDE THE HIGH, LOW AND OPTIMUM PLUS ANY MATHEMATICAL OR MANUAL MODEL USED IN OBTAINING THESE FACTORS AND ASCERTAINING THE SELECTION OF THIS ALTERNATIVE SYSTEM/EQUIPMENT.

DATE: 2-FEB-90  
TIME: 10:51

APJ 966 - 246  
DATA FLOWS

PAGE 4  
EXCELERATOR 1.84

Name	Label	Description
SPLY/FAC/DTA	SUPPORT EQUIPMENT DATA	ACRONYMS:  PURPOSE: THIS DATA FLOW CARRIES THE SUPPORT EQUIPMENT AND FACILITIES FACTORS AND MODELS (MATHEMATICAL &/OR MANUAL) THAT WERE USED IN THE TRADE-OFF ANALYSIS. THEY WILL BE USED IN THE INDIVIDUAL SENSITIVITY ANALYSIS TO DETERMINE THE PARAMETERS OF CHANGE THAT CAN BE MADE WITHOUT AFFECTING THE STATED READINESS GOALS OF THE SYSTEM/EQUIPMENT.
SPPRT/FAC/REORG	REORGANIZED SUPPORT FACILITY FACTORS	ACRONYMS:  PURPOSE: THIS DATA FLOW CARRIES THE REORGANIZED HIGH DRIVER (KEY FACTORS) OBTAINED THROUGH THE TRADE-OFF ANALYSIS AND CONTAINS THE HIGH, LOW AND OPTIMUM FACTORS AND THE MODELS USED AT ARRIVING AT THIS ALTERNATIVE CHOICE. REFERENCE: TASK 303.2.13
SPPRT/FCLTY/CNCPTS	SUPPORT EQUIPMENT CONCEPTS TRADE-OFF FACTORS	ACRONYMS:  PURPOSE: THIS DATA FLOW CARRIES SUPPORT EQUIPMENT AND FACILITY ALTERNATIVE CONCEPTS, THE HIGH DRIVER FACTORS AND MODELS (MATHEMATICAL &/OR MANUAL) THAT WERE USED WITH EACH ALTERNATIVE TO ESTABLISH THEIR CAPABILITIES IN MEETING THE READINESS GOALS OF THE SYSTEM/EQUIPMENT.
SPRS/FCTRS	SUPPLY SUPPORT FACTORS	ACRONYMS:  PURPOSE: THIS DATA FLOW CARRIES THE SUPPLY SUPPORT FACTORS USED IN THE TRADE-OFF ANALYSIS TOGETHER WITH ANY MODELS (MATHEMATICAL AND/OR MANUAL) THAT RESULTED IN THE SELECTION OF THIS SYSTEM/EQUIPMENT TO MEET THE STATED READINESS GOALS. THESE FACTORS WILL BE VARIED IN THE INDIVIDUAL SENSITIVITY ANALYSIS TO DETERMINE AT WHAT POINT THEY AFFECT THE STATED READINESS GOALS. THE RESULTS OF THIS ANALYSIS WILL ENABLE THE SELECTION OF PARAMETERS FOR USE WITH OTHERS IN THE COMBINED ANALYSIS TO DETERMINE THE SENSITIVITY OF THE READINESS OBJECTIVES TO FAILURES, CHANGES, ETC.
SUPLU/SUPRT/F	SUPPLY SUPPORT FACTORS	ACRONYMS:  PURPOSE: THIS DATA FLOW CARRIES THE HIGH DRIVER FACTORS (HIGH, LOW, OPTIMUM) AND MODELS USED IN THE TRADE-OFF ANALYSIS TO DETERMINE THAT THIS ALTERNATIVE SELECTION WOULD MEET THE READINESS GOALS OF THE SYSTEM/EQUIPMENT MISSION. ITEMS TO BE CONSIDERED ARE REPAIR OR REPLACE DECISIONS, FAILURE VOLUME, DISTANCE, RESOURCE AND TIME REQUIREMENTS, AVAILABILITY OF FIXED AND/OR MOBILE FACILITIES, CONSUMABLE USAGE RATE AND OTHERS.
SUPP/FAC/FACTORSS	SUPPORT FACILITY FACTORS	ACRONYMS:  PURPOSE: THIS DATA FLOW CARRIES THE HIGH DRIVER (KEY SUPPORT FACILITY) FACTORS AND THE MODELS THAT WERE USED IN THE TRADE-OFF ANALYSIS AND SHOWED THAT THIS ALTERNATIVE SELECTION WOULD MEET THE STATED READINESS GOALS OF THIS ILS ELEMENT FOR THE SYSTEM/EQUIPMENT MISSION.



DATE: 2-FEB-90  
TIME: 10:51

APJ 966 - 246  
DATA FLOWS

PAGE 5  
EXCELERATOR 1.84

Name	Label	Description
TRANS/DTA	TRANSPORT- ATION & TRANSPORT- ABILITY DATA	ACRONYMS:  PURPOSE: THIS DATA FLOW CARRIES THE FACTORS AND MODELS (MATHEMATICAL &/OR MANUAL) OF TRANSPORTATION AND TRANSPORTABILITY THAT WILL BE USED IN THE INDIVIDUAL SENSITIVITY ANALYSIS TO DETERMINE THE PARAMATERS AT WHICH FURTHER CHANGE IN THE RELEVANT VARIABLES WILL CAUSE THE READINESS TO FALL BELOW THE STATED GOALS OF THIS SYSTEM EQUIPMENT.
TRANS/FCTRS	TRANSPORT & TRANSPORT- ABILITY FACTORS	ACRONYMS:  PURPOSE: THIS DATA FLOW CARRIES THE HIGH DRIVER FACTORS OF TRANSPORTATION & TRANSPORATABILITY TOGETHER WITH THE MODELS (MATHEMATICAL &/OR MANUAL) THAT WERE USED IN THE TRADE-OFF ANALYSIS TO ESTABLISH THAT THIS SYSTEM/EQUIPMENT ALTERNATIVE WOULD MEET THE STATED READINESS OBJECTIVES.
TRNG/DTA	TRAINING & TRAINING DEVICE DATA	ACRONYMS:  PURPOSE: THIS DATA FLOW CONTAINS THE ORGANIZED KEY FACTORS AND RELATED MODELS OF THE TRAINING & TRAINING DEVICE ELEMENT TO BE USED IN THE INDIVIDUAL SENSITIVITY ANALYSIS. THIS WILL PROVIDE THE PARAMETERS ON OF THOSE FACTORS OUTSIDE OF WHICH ANY FURTHER MODIFICATION OR CHANGE WILL CAUSE THE SYSTEM/EQUIPMENT READINESS TO FALL BELOW ITS STATED GOALS.
TRNG/FCTRS	TRAINING & TRAINING DEVICE FACTORS	ACRONYMS:  PURPOSE: THIS DATA FLOW CARRIES THE HIGH DRIVERS (KEY FACTORS) AND THE MODEL(S) THROUGH WHICH THEY WERE PROCESSED IN THE TRADE-OFF ANALYSIS FOR THE TRAINING & TRAINING DEVICE ELEMENT. ACCOMPANYING THIS SRE THE HIGH, LOW AND OPTIMUM VALUES FOR THAT FACTOR AND THE READINESS VALUE FOR THAT OPTIMUM.
UPD/FILS/SENS	UPDATE FILES WITH RESULTS OF SENSITIV- ITY ANALYSIS	ACRONYMS:  PURPOSE: THIS DATA FLOW CARRIES THE RESULTS OF THE INTEGRATED SENSITIVITY ANALYSIS TO FILES AAF, PM/DF, P/F, RSI, AND DB/DBF SO THAT THEY MAY BE UPDATED.
tech/guide	LOGISTIC SUPPORT ANALYSIS TECHNIQUES GUIDE	ACRONYMS:  PURPOSE: THIS DATA FLOW CARRIES THE INFORMATION REGARDING ALGORITHMS AND MATHEMATICAL MODELS AVAILABLE IN THE LATEST RELEASE OF AMC-P 700-4 LOGISTICS SUPPORT ANALYSIS TECHNIQUES GUIDE.

DATE: 2-FEB-90  
TIME: 10:51

APJ 966 - 246  
DATA STORES

PAGE 1  
EXCELERATOR 1.84

Name	Label	Description
P/F	POLICY FILES	<p>CONTAINS THOSE MILITARY PUBLICATIONS, DECISION PAPERS, MISSIONS &amp; FUNCTIONS, etc, WHICH ARE NEEDED TO ESTABLISH THE LOGISTICAL SUPPORT AND REVIEW REQUIREMENTS OF THE ITEM/EQUIPMENT DEVELOPMENT PROGRAM.</p> <p>THIS DATA STORE INCLUDES:</p> <ol style="list-style-type: none"><li>1. AR 12-16, "MUTUAL LOGISTICS SUPPORT BETWEEN THE U.S. AND OTHER NORTH ATLANTIC TREATY ORGANIZATION FORCES"</li><li>1a. AR 70-1, "SYSTEMS ACQUISITION POLICY AND PROCEDURES"</li><li>1b. AR 70-2, "RESEARCH, DEVELOPMENT, &amp; ACQUISITION MATERIEL STATUS RECORDING"</li><li>1c. AR 70-10, "R&amp;D - TEST &amp; EVALUATION DURING DEVELOPMENT AND ACQUISITION OF MATERIEL"</li><li>1d. "AR 570-9, "MANPOWER AND EQUIPMENT CONTROL - HOST NATION SUPPORT"</li><li>2. AR 700-9, "POLICIES OF THE ARMY LOGISTIC SYSTEM"</li><li>3. AR 700-82, "JOINT REGULATION GOVERNING THE USE AND APPLICATION OF UNIFORM SOURCE MAINTENANCE AND RECOVERABILITY CODES"</li><li>4. AR 700-127, "INTEGRATED LOGISTICS SUPPPORT"</li><li>5. AR 725-50, "REQUISITIONING, RECEIPT AND ISSUE SYSTEM"</li><li>6. AR 750-1, "MAINTENANCE OF SUPPLIES &amp; EQUIPMENT - ARMY MATERIEL MAINTENANCE CONCEPTS &amp; POLICIES"</li><li>7. AMC-R-700-27, "LEVEL OF REPAIR ANALYSIS (LORA) PROGRAM"</li><li>8. AMC-R-750-10, "DEPOT MAINTENANCE INTERSERVICE"</li><li>9. DA PAM 700-4</li><li>10. DA PAM 700-28, "INTEGRATED LOGISTIC SUPPORT PROGRAM ASSESSMENT ISSUES AND CRITERIA"</li><li>11. DA PAM 700-30, "INTEGRATED LOGISTIC SUPPORT - DEVELOPMENTAL SUPPORTABILITY TEST AND EVALUATION GUIDE"</li><li>12. DA PAM 700-55, "INSTRUCTIONS FOR PREPARING THE INTEGRATED LOGISTIC SUPPORT PLAN"</li><li>12a. DA PAM 738-750, "THE ARMY MAINTENANCE MANAGEMENT SYSTEMS (TAMMS)"</li><li>13. DA PAM 750-21, "LOGISTIC SUPPORT MODELLING"</li><li>14. AMC PAM 700-4, "LOGISTICS SUPPORT ANALYSIS TECHNIQUES GUIDE (WITH PALMAN)"</li><li>14a. AMC PAM 700-11, "LOGISTICS SUPPORT ANALYSIS REVIEW TEAM GUIDE"</li><li>15. AMC PAM 750-2, "MAINTENANCE OF SUPPLIES AND EQUIPMENT GUIDE TO RELIABILITY CENTERED MAINTENANCE"</li><li>16. MIL-STD-152, "TECH REVIEW GUIDELINES"</li><li>17. MIL-STD-210A, "CLIMATIC EXTREMES FOR MILITARY EQUIPMENT"</li><li>18. MIL-STD-470, -471, "MAINTAINABILITY STANDARDS"</li><li>19. MIL-STD-756, "RELIABILITY MODELLING &amp; PREDICTIONS"</li><li>20. MIL-STD-780, "MAINTENANCE ENGINEERING ANALYSIS CONTROL NUMBER (MEACNS) FOR AERONAUTICAL EQUIPMENT, UNIFORM NUMBERING SYSTEM"</li><li>21. MIL-STD-781, "RELIABILITY DESIGN QUALIFICATION AND PRODUCTION ACCEPTANCE TESTS: EXPONENTIAL DISTRIBUTION"</li><li>22. MIL-STD-785B, "RELIABILITY PROGRAM FOR SYSTEMS AND EQUIPMENT DEVELOPMENT &amp; PRODUCTION"</li><li>23. MIL-STD-810, "ENVIRONMENTAL TEST METHODS &amp; ENGINEERING GUIDELINES"</li><li>24. MIL-STD-881, "WORK BREAKDOWN STRUCTURES FOR DEFENSE MATERIEL ITEMS"</li><li>25. MIL-STD-882, "SYSTEM SAFETY PROGRAM REQUIRMENTS"</li><li>26. MIL-STD-965, "PARTS CONTROL PROGRAM"</li><li>27. MIL-STD-1369A, "INTEGRATED LOGISTIC SUPPORT PROGRAM REQUIREMENTS"</li><li>28. MIL-STD-1388-1A, "LOGISTICS SUPPORT ANALYSIS"</li><li>29. MIL-STD-1388-2A, "LOGISTICS SUPPORT ANALYSIS RECORD"</li><li>30. MIL-STD-1629, "PROCEDURES FOR PERFORMING A FAILURE MODE, EFFECTS</li></ol>

DATE: 2-FEB-90  
TIME: 10:51

APJ 966 - 246  
DATA STORES

PAGE 2  
EXCELERATOR 1.84

Name	Label	Description
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& CRITICALITY ANALYSIS"

31. MIL-HDBK-472, "MAINTAINABILITY PREDICTION"

32. MIL-M-24100B, "FUNCTIONALLY ORIENTED MAINTENANCE MANUALS (FOMM)  
FOR EQUIPMENT & SYSTEMS"

RSI/POL/F

RSI POLICY & RATIONALIZATION, STANDARDIZATION, INTEROPERABILITY (RSI) POLICY FILE AND  
AGREEMENTS FILE AGREEMENTS FILE

PURPOSE OF DATA STORE : This data store contains information on  
policies, directives, established agreements such as STANAG's,  
QSTAG's, etc. to be utilized in the implementation of RSI.

SOURCE OF DATA : AR's 32-1, 32-2, 32-3, 32-4; NATO AAP 4. DA PAM 310-35,  
AR 700-66

DATE: 2-FEB-90  
TIME: 10:29

APJ 966 - 246  
EXTERNAL ENTITIES

PAGE 1  
EXCELERATOR 1.94

Name	Label	Description
MODEL/SOURCES	SOURCES OF MATH MODELS	THIS EXTERNAL ENTITY CONTAINS SOURCES OF MATHEMATICAL MODEL INFORMATION INCLUDING BUT NOT LIMITED TO SOFTWARE VENDORS, UNIVERSITIES, DOD CONTRACTORS AND SUBCONTRACTORS. THESE SOURCES WILL PROVIDE THE LATEST TECHNIQUES AVAILABLE THAT COULD POSSIBLY SUPPORT THE CREATION OR PROVIDE FOR THE MULTI-VARIATE MODEL REQUIRED TO PROCESS THE COMBINED HIGH RISK FACTOR OF ALL OF THE AFFECTED ILS ELEMENTS.
PM/ILSMT	PM/ILSMT INITIATE REQRMNT	THE PROGRAM MANAGER OR THOSE ACTIVITIES, AGENCIES, OR AUTHORITIES THAT ARE RESPONSIBLE FOR THE INITIATION OF THE REQUIREMENT FOR AN ILS ELEMENT ASSESSMENT DURING A DEVELOPMENT PROGRAM FOR A SYSTEM AND/OR EQUIPMENT IN ACCORDANCE WITH AR 700-127. THE KEY ACTION (OUTPUT) REQUIRED OF THIS EXTERNAL ENTITY IS THE DIRECTIVE, AUTHORITY, OR OTHER DOCUMENTATION THE INITIATES THE REQUIREMENT FOR THE APPLICATION OF THIS ILS ASSESSMENT TO A SPECIFIC SYSTEM/EQUIPMENT DEVELOPMENT PROGRAM AT A SPECIFIED POINT IN ITS LIFE CYCLE.

## **ANNEX C**

### **LSA SUBTASK 303.2.4 SENSITIVITY ANALYSIS STRUCTURED DESIGN**

ANNEX C  
LSA TASK 303  
EVALUATION OF ALTERNATIVES AND TRADE-OFF ANALYSIS

**PROCESS - 303.2.4.1 - LIST KEY DESIGN AND SUPPORT FACTORS**

**Objective:** Organize the key factors of the high drivers for each affected ILS element by the design and support mission parameters as they were used in the Trade-Off Analysis to arrive at the selection of this alternative system/equipment and its capabilities to meet the stated readiness goals for its mission.

**Procedure:**

1. Obtain, organize and examine all documentation used in and resulting from the Trade-Off Analysis (Task 303) for the selected alternative system/equipment. This can include the results of sensitivity analyses that were conducted as part of the Trade-Off analyses, the results of the Trade-Off analyses themselves and documents used in developing them.

Note: Each of the ILS elements containing high drivers will be processed through an individual sensitivity analysis. The procedures for this remain the same even though the drivers and models used may differ.

2. Using the "ILS Element Sensitivity Analysis Driver Listing" form (page C-14), organize by ILS element those key factors for the high drivers that resulted from the analysis.
  - A. Under "Element Id.", designate the relevant element (i.e., Manpower/Personnel Skills, Reliability & Maintenance, etc.)
  - B. Under "High Drivers Id.", designate the factors indicated in the Trade-Off Analysis documentation as the relevant driver.
  - C. Under the "Sources" column, indicate the documentation source of the of High Driver (i.e., Task /report # and document identification).
  - D. Under "Mathematical Models", list any reference which will identify the model that was used to determine the factor(s) for this driver, its algorithm, variables, constants and assumptions.

References: Tasks 303.2.2 & .3, 303.2.5 - .12 Table 1 - "Elements Impacted by Trade-Off Analysis (page C-12)

PROCESS - 303.2.4.1A1 - STANDARDIZATION AND INTEROPERABILITY  
PARAMETERS

Objective: To select and reorganize the Standardization and Interoperability factors so those with the highest likelihood of causing supply and interoperability problems will be processed through the sensitivity analysis first. Information regarding mathematical models used and impacts on other ILS elements will accompany these factors. Costs and support must also be given consideration when analyzing the impact of the changed high driver.

Procedure:

1. From the "ILS Element Sensitivity Analysis Driver Listing", and the results of Tasks 303.2.7, 303.2.10 and 303.2.11, review the sources of information pertaining to the High Drivers listed for this element.
2. Using the "\_\_\_\_\_ Sensitivity Analysis" form (page C-15), insert Standardization & Interoperability on the dashes. Organize and record the High drivers by type within Standardization & Interoperability.
3. For each high driver, determine the "Low, High, Optimum and Readiness" factors documented when designating the optimum system/equipment alternative in the Trade-Off Analysis. Add these to the "\_\_\_\_\_ Sensitivity Analysis" form. They can be obtained from output graphs or tables resulting from the analysis.

Note: Typical high drivers include but are not limited to interchangeability between operating systems, equipments, components, parts, and between services, with other Allied services, and through the use of proven components and subsystems.

Process - 303.2.4.1A2 - RELIABILITY AND MAINTENANCE PARAMETERS

Objective: To select and reorganize the high drivers of the Reliability and Maintenance element factors so that those with the most likelihood of causing equipment and support problems will be processed through the sensitivity analysis first. Information regarding mathematical models used and impacts on other ILS elements will accompany these factors. Costs and support must also be given consideration when analyzing the impact of the changed high driver.

**Procedure:**

1. From the ILS Element Sensitivity Analysis Driver Listing and the results of Tasks 303.2.3 and 303.2.7, .8 and .11, review the sources of information pertaining to the High Drivers listed for this element.
2. Using the "\_\_\_\_\_ Sensitivity Analysis" form, insert "Reliability & Maintenance" on the dashes. Then organize and record the high drivers of this element by type.
3. For each high driver, determine the "Low, High, Optimum and Readiness" factors documented when designating the optimum system/equipment alternative in the Trade-Off Analysis. Add these to the "\_\_\_\_\_ Sensitivity Analysis" form. They can be obtained from output graphs or tables resulting from the analysis.

Note: Typical high drivers include but are not limited to: MTBM, MTBF, MTTR, ease of component/part accessibility, safety characteristics, self test capability, designated levels of repair and maintenance and factors reviewed in other ILS elements that affect this element (i.e., compatibility of equipment).

**Process - 303.2.4.1A3 - SUPPORT EQUIPMENT PARAMETERS**

**Objective:** To select and reorganize the high drivers of the Support Equipment element so that those with the most likelihood of causing problems due to the lack or selection of support equipment and facilities will be processed through the sensitivity analysis first. Information regarding mathematical models used and impacts on other ILS elements will accompany these factors. Costs and support must also be given consideration when analyzing the impact of the changed high driver.

**Procedure:**

1. From the ILS Element Sensitivity Analysis Driver Listing, and the results of Tasks 303.2.2-4, 303.2.7&.8, review the information pertaining to the High Drivers listed for this element.
2. Using the "\_\_\_\_\_ Sensitivity Analysis" form, insert "Support Equipment & Facilities" on the dashes. Then organize and record the high drivers for this element by type.



3. For each high driver, determine the "Low, High, Optimum and Readiness" factors documented when designating the optimum system/equipment alternative in the Trade-Off Analysis. Add these to the "\_\_\_\_\_ Sensitivity Analysis" form. They can be obtained from output graphs or tables resulting from the analysis.

Note: Typical high drivers include but are not limited to: Test, Measure, Diagnostic, Calibration, Recovery, and Evacuation equipment, procedures for the use of these equipments, Generators, dedicated Vehicles, Special (not already in inventory) Tools & Kits, Major System Components, Training, Depot, Testing, Manprint considerations.

**PROCESS - 303.2.4.1A4 - MANPOWER/PERSONNEL SKILL AVAILABILITY FACTORS**

**Objective:** To select and reorganize the high drivers of the Manpower/Personnel Skill Availability element so those with design and support constraints having the highest likelihood of causing manpower and skill shortages will be processed through the sensitivity analysis first. Information regarding mathematical models and impacts on other ILS elements will accompany these factors. Costs must also be given consideration when analyzing the impact of the changed high driver.

**Procedure:**

1. From the ILS Element Sensitivity Analysis Driver Listing and the results of Tasks 303.2.2 & .3, 303.2.5 through .8, review the sources of information pertaining to the High Drivers listed for this element.
2. Using the "\_\_\_\_\_ Sensitivity Analysis" form, insert "Manpower/Personnel" on the dashes. Then organize and record the high drivers of that element by type.
3. For each high driver, determine the "Low, High, Optimum and Readiness" factors documented when designating the optimum system/equipment alternative in the Trade-Off Analysis. Add these to the "\_\_\_\_\_ Sensitivity Analysis" form. They can be obtained from output graphs or tables resulting from the analysis.

Note: Typical high drivers include but are not limited to: Projected task workloads, numbers of personnel allocated to each functional area and level, MOS school output and new and unique skills that are required.

Specific references:           Task 303.2.5.4A4  
                                  Task 303.2.5.4A3  
                                  Task 303.2.5.5A5

**PROCESS - 303.2.4.1A5 - SUPPLY SUPPORT FACTORS**

**Objective:** To select and reorganize the high drivers of the ILS Supply Support element so that those with the highest likelihood of resulting in support problems or significantly affecting costs will be processed through the sensitivity analysis first. Information regarding mathematical models or other procedures used and impacts on other ILS elements will accompany these factors. Costs and support must also be given consideration when analyzing the impact of the changed high driver.

**Procedure:**

1. From the ILS Element Sensitivity Analysis Driver Listing and the results of Tasks 303.2.3 and 303.2.7, review the sources of information pertaining to the High Drivers listed for this element.
2. Using the "\_\_\_\_\_ Sensitivity Analysis" form, insert Supply Support on the dashes. Organize and record the high drivers by type.
3. For each high driver, determine the "Low, High, Optimum and Readiness" factors documented when designating the optimum system/equipment alternative in the Trade-Off Analysis. Add these to the "\_\_\_\_\_ Sensitivity Analysis" form. They can be obtained from output graphs or tables resulting from the analysis.

Note:           Typical high drivers include but are not limited to: the number of failures; repair or replace decisions; distances, resources and times needed for supply support; available fixed and mobile facilities; rate of usage for consumable; requirements for storage, handling & lifting equipment, security; wartime reserves; hazardous materials consideration, equipment density & distribution.

**Process - 303.2.4.1A6 - COST ANALYSIS AND FUNDING FACTORS**

**Objective:** To select and reorganize the High Drivers of the Cost Analysis and Funding ILS element so that those with the most likelihood to adversely affect cost and funding profiles (e.g., non-budgeted costs, unwarranted supplies and equipments) will be processed through the sensitivity analysis first.

Information regarding mathematical models used and impacts on other ILS elements and system readiness will accompany these factors. Support must also be given consideration when analyzing the impact of the changed high drivers.

**Procedure:**

1. From the ILS Element Sensitivity Analysis Driver Listing, review the sources of information pertaining to the High Risk Drivers listed for this element.
2. Using the "\_\_\_\_\_ Sensitivity Analysis" form, insert Cost Analyses & Funding on the dashes. Then organize and record the high drivers by type.
3. For each high driver, determine the "Low, High, Optimum and Readiness" factors documented when designating the optimum system/equipment alternative in the Trade-Off Analysis. Add these to the "\_\_\_\_\_ Sensitivity Analysis" form. They can be obtained from output graphs or tables resulting from the analysis.

Note: Typical high drivers include but are not limited to: full design budgeting to include tools, support equipment, technical assistance, expendables, facilities, testing, resource management, etc. Support factors include budgeting for the complete life cycle, provisioning, O&S, etc. Determination must be made if these are less than adequate.

**Process - 303.2.4.1A7 - SUPPORT FACILITIES FACTORS**

**Objective:** To select and reorganize the High Drivers of the Support Facilities ILS element so that those identified as being unavailable, requiring special consideration, or having problems that could result in failure to meet the support requirements, should be the first to be processed through the sensitivity analysis. Information regarding mathematical models used and impacts on other ILS elements and systems readiness will accompany these factors. Costs must also be given consideration when analyzing the impact of any changed high driver.

**Procedure:**

1. From the ILS Element Sensitivity Analysis Drive history, and the results of Tasks 303.2.3-.4, .7, .10, .12, and .13, review the sources of information pertaining to the high drivers for this element.

2. Using the "\_\_\_\_\_ Sensitivity Analysis" form, insert Training & Training Devices on the dashes. Then organize and record the high drivers by type.
3. For each high driver, determine the "Low, High, Optimum and Readiness" factors documented when designating the optimum system/equipment alternative in the Trade-Off Analysis. Add these to the "\_\_\_\_\_ Sensitivity Analysis" form. They can be obtained from output graphs or tables resulting from the analysis.

Note: Typical high drivers include but are not limited to changes in the following schedules that affect the critical path facilities availability, deployment, new construction, modification & delivery for POL, ammunition, hazard classified material; adequacy of working storage and administrative space availability of security, power, light, back-up power compatibility of transportation, ISO, shared & joint use facilities.

#### **Process - 303.2.4.1A8 - TRAINING AND TRAINING DEVICE FACTORS**

**Objective:** To select and reorganize the High Drivers of the Training and Training Device ILS element so that those identified as having problems that would cause failure to meet the training requirements will be processed through the sensitivity analysis first. Information regarding mathematical models used and impacts on other ILS elements and system readiness will accompany these factors. Costs and support must also be given consideration when analyzing the impact of the changed high driver.

#### **Procedure:**

1. From the ILS Element Sensitivity Analysis Driver Listing, and the results of Tasks 303.2.2, .03, .05, and .06, review the sources of information pertaining to the high drivers for this element.

Note: Typical high drivers include but are not limited to: the adequacy of the training plan, factory and school training, instructor and personnel training, manuals, skills specialties, agreements, tests, evaluation, joint service training.

**Process - 303.2.4.1A9 - TRANSPORTATION & TRANSPORTABILITY  
FACTORS**

**Objective:** To select and reorganize the High Drivers of the Transportation and Transportability ILS element so that those identified as having problems that could cause failure in meeting the transportation requirements will be processed through the sensitivity analysis first. Information regarding mathematical models used and impacts on other ILS elements will accompany these factors. Costs must also be given consideration when analyzing the impact of the changed driver.

**Procedure:**

1. From the ILS Element Sensitivity Analysis Driver Listing, and the results of Task 303.2.12, review the sources of information pertaining to the High Drivers listed for this element.
2. Using the "\_\_\_\_\_ Sensitivity Analysis" form, insert Transportation & Transportability on the dashes. Then organize and record the high drivers by type.
3. For each high driver, determine the "Low, High, Optimum and Readiness" factors documented when designating the optimum system/equipment alternative in the Trade-Off Analysis. Add these to the "\_\_\_\_\_ Sensitivity Analysis" form. They can be obtained from output graphs or tables resulting from the analysis.

Note: Typical high drivers include but are not limited to: the adequacy of the types of transport, size and mass constraints, customs problems, equipment, container compatibility. & DOT restrictions.

**Process - 303.2.4.1A10 - INDIVIDUAL SENSITIVITY ANALYSES**

**Objective:** To determine the outside bound value within the range that each ILS element factor can be varied and still have the system/equipment meet the stated readiness goals.

**Procedure:**

1. For each element sensitivity analysis, gather the assembled documentation and review the high-low range that was indicated on the "\_\_\_\_\_ Sensitivity Analysis" form.
2. Using design factors (Type 1) initially, vary the factor within the High - Low range indicated and document the affect on readiness (if any).

Note: Rerun the original model used, varying the factors over the range indicated on the "\_\_\_\_\_ Sensitivity Analysis" form holding all other variables constant except readiness to determine the effect of their design considerations on readiness.

3. Continue varying the factor until the readiness falls below its required value. Then vary the change minutely in the opposite direction until the readiness is once again at its required value. This factor is the breakpoint between acceptable and unacceptable readiness.
4. Record this outside bound on the "\_\_\_\_\_ Sensitivity Analysis" form with a reference identification to indicate that a significant change in readiness will be assessed.

Note: For those factors that have already been examined in other ILS elements and shown to affect this element, consider any changes outside the range examined but within those designated for this element.

5. Assess the effect of the selected factor on System Readiness using the "Sensitivity Analysis - Impact of Changes Assessment" form where additional consideration will be given to its affect on other ILS elements and on cost and support parameters. (See Table 2 - Trade-Off Relationships between ILS Elements.)
6. Continue until all Type 1 "Design" parameters are processed.
7. Repeat steps 1 - 6 for Type 2 "Support" parameters.

#### **Process - 303.2.4.2 - DEVELOP SENSITIVITY MODEL**

**Objective:** To review the mathematical models used for each ILS element in the Trade-Off Analyses with the underlying variables, constants and assumptions to determine the extent, complexity and requirements in order to develop a combined multi-variate model addressing all such items. This model will be developed to hold the readiness factor constant and allow each of the factors developed in Process 303.2.4.1A9 to show their affects on other elements. The effects shown must be within the high - low factors developed in the Trade-Off Analyses.

#### **Procedure:**

1. Review each mathematical model used, listing its variables, constants, assumptions and the algorithm showing the relationships between them.

2. Review documentation regarding models available from DoD contractors, universities and other sources of such data to determine if newer techniques are capable of being used in developing this model.
3. Layout all the available factors and develop the model so that its results will provide output on the interrelationships and still maintain the stated system readiness goals.
4. Document the model algorithms and automate if possible. Use the "Readiness Sensitivity Model Information" form for this.

**Process - 303.2.4.3 - READINESS SENSITIVITY ANALYSIS**

**Objective:** To analyze the effects of using the outside bounds of each of the high drivers on other high drivers and ILS elements while maintaining the stated readiness goals of the system/equipment.

**Procedure:**

1. Organize the high driver outside bound factors by those with the least significance first. When processed through the model, this will show their effect on the more significant (higher priority) drivers. Take this factor from the "\_\_\_\_\_ Sensitivity Analysis" form.
2. Select the factor with the least significance and process it through the model holding the readiness factor constant.
3. Examine the output to determine the effects of this variable on the other variables in the model. Record these affects as an assessment on the "Sensitivity Analysis Assessment" form. (page C-17)

**Note:** The assessment to be made is based upon the output of the analysis, describe the process(es) used and how the process(es) and the results affect other drivers. The reviewer must ascertain that the affected variable remain within the high - low ranges established for each factor as a result of the Trade-Off Analyses. Variables causing other factors to fall outside their high - low ranges are unacceptable.

4. Select the next least significant factor and repeat steps 1 - 3. Continue this process until all factors are processed.

Process - 303.2.4.4 - REPORT ON READINESS SENSITIVITY

Objective: To report the results of the sensitivity analysis.

Procedure:

Format the output from the sensitivity analysis for two (2) areas.

1. To update tasks 303, 401 and 402.
2. To provide an output report for review by the Program/ILS Manager and personnel from related disciplines, containing graphs and tables supporting the reviewer's assessments.



	303.2.2	303.2.3	303.2.4	303.2.5	303.2.6	303.2.7	303.2.8	303.2.9	303.2.10	303.2.11	303.2.12	303.2.13
STANDARDIZATION & INTEROPERABILITY	X	X	X			I		I		I		
RELIABILITY & MAINTENANCE	X	X	X			X	X		X			
SUPPORT	X	X	X			X			I		I	
EQUIPMENT												
MANPOWER & PERSONNEL	X	X	X	X	X		I					
SUPPLY	X	X	X			X			I	I	I	I
SUPPORT												
LOGISTICS	X	X	X	I	I	X	X	X		I		X
TRAINING & TRAINING DEVICES	X	X	X	X	X		I					
TRANSPORTATION & TRANSPORTABILITY			X							X	X	X
DESIGN	X	X	X			X	X	X	X	X	X	X
SUPPORT FACILITIES	X	X	X			X			X	X	X	X

I = ELEMENTS IMPACTED AS A RESULT OF THE ANALYSES

X = ELEMENTS FOR CONSIDERATION

TABLE 1 - Elements Impacted by Trade-Off Analysis

STANDARDIZATION & RELIABILITY		SUPPORT		MANPOWER		SUPPLY		COST		TRAINING		TRANSPORTATION & DESIGN	
INTERDEPENDIBILITY		MAINTENANCE		EQUIPMENT		PERSONNEL		SUPPORT		TRAINING DEVICES		TRANSPORTABILITY	
STANDARDIZATION & RELIABILITY	INTERDEPENDIBILITY	MAINTENANCE	EQUIPMENT	PERSONNEL	SUPPORT	COST	TRAINING	TRANSPORTATION & DESIGN	INTERDEPENDIBILITY	MAINTENANCE	EQUIPMENT	PERSONNEL	SUPPORT
STANDARDIZATION & RELIABILITY													
RELIABILITY & MAINTENANCE													
SUPPORT & EQUIPMENT													
MANPOWER & PERSONNEL													
SUPPLY & SUPPORT													
COST & TRAINING													
TRAINING DEVICES & TRANSPORTATION & TRANSPORTABILITY													
DESIGN & SUPPORT FACILITIES													
X - RELATED ELEMENT													
S - SELECTED ELEMENT													

TABLE 2 - Trade-Off Relationships Between IIS Elements

PART NUMBER:

---

END ITEM NUMBER:  
NOMENCLATURE:  
PART NUMBER:

[illegible]

C-15

SENSITIVITY ANALYSIS - IMPACT OF CHANGES ASSESSMENT

END ITEM NUMBER:

NOMENCLATURE:

PART NUMBER:

REFERENCE IDENTIFICATION:

ASSESSMENT OF IMPACT OF HIGH DRIVER FACTORS ELEMENT'S READINESS  
AND ON OTHER ELEMENTS

SENSITIVITY ANALYSIS ASSESSMENT

END ITEM NUMBER:  
NOMENCLATURE:  
PART NUMBER:

REFERENCE ID:

RECORD ASSESSMENT OF THE IMPACT MADE BY THIS OUTSIDE BOUNDING FACTOR  
ON OTHER FACTORS

READINESS SENSITIVITY MODEL INFORMATION

PROCESS: 303.2.4.2 - DEVELOP SENSITIVITY MODEL  
DOCUMENT THE MODEL ALGORITHMS, DEFINITION OF EACH VARIABLE AND EXPLAIN HOW  
THESE ALGORITHMS WERE DEVELOPED AND THEIR USES.

## **ANNEX D**

—

### **LSA SUBTASK 303.2.4 VERT APPLICATION METHODOLOGY**



## VERT APPLICATION METHODOLOGY

### BACKGROUND:

Venture Evaluation and Review Technique (VERT) was developed as a network analysis technique to facilitate management decision making. It allows a systematic planning and control of programs and enables managers to find solutions to real life managerial problems.

The terms of the APJ contract require the provision of batch files for each of the VERT networks associated with the various Data Flow Diagrams in the APJ 966 projects.

APJ has been successful in adopting a method for the creation of these networks using the existing EXCELERATOR software package and establishing a naming convention compatible with that used in the Data Flow Diagrams. To do this APJ has made use of the PC model of VERT. A Structured Analysis project was used for this purpose. The prototype VERT network structure was made for one top level and one lower level data flow diagram.

The PC model of VERT has certain limitations built into it. To overcome some of these limitations, certain conventions were used to create the input files. To maintain full generality a set of "dummy" default values were established. The model allows the user to alter the default values of time, cost, and performance to satisfy their specific requirements.

### METHODOLOGY:

The basic symbols used to structure the network are:

(i) **SQUARES** - to indicate NODES. These are decision points in the project, or points beyond which the project cannot proceed unless certain criteria are met. There are two type of nodes, one which supports input operations and, the second type which supports output operations.

(ii) **LINES** - to indicate ARCS which are activities that have time, cost, and performance criteria associated with them.

In practice, however, both the arcs and nodes are similar, in that both have time, cost, and performance criteria associated with them. The arcs have a primary and a cumulative set of time, cost, and performance criteria whereas the nodes have only a single cumulative set.

(iii) **NAMING CONVENTIONS** - Efforts have been made to keep the naming convention as compatible as possible to the Data Flow Diagrams. The naming convention used is displayed below.

**NODES** - All nodes are prefixed with the letter **N**. The individual Nodes are identified by a number and a letter. The number refers to the number of the node within the diagram and the letter refers to the diagram number in the project. In the event that a node has been referenced in an earlier diagram they also carry the number of the node in the earlier diagram as a prefix to the individual node number.

#### **N2.4A**

- N** - All nodes are prefixed with the letter **N**
- 2** - Gives the number of the node it relates to in a higher level diagram or an earlier data flow diagram within the project. In this case it refers to node **N2** of the top level diagram.
- 4** - Gives the number of the node it relates to in a higher level diagram or an earlier data flow diagram within the project. In this case it refers to node **N2** of the top level diagram.
- A** - The nodes in each subsequent explosion are allotted an alphabetical suffix indication the number of the explosion diagram in the particular project. In this case it is the first lower level diagram within the project.

**ARCS** - All arcs are prefixed with either the letter **C** or **E**. The individual Arcs are identified by two numbers. The first number refers to the number of the arc within the diagram and the second number refers to the number of the diagram within the project. In the event that an arc has been referenced in an earlier diagram they also carry the number of the arc in the earlier diagram as a prefix to the individual arc number. The arcs which are identified by the letter **E** have direct reference to a process in the corresponding data flow diagram and as such are named the same as the process itself.

- C - All arcs are prefixed with the letter C. In some cases, however, arcs carry a prefix of E. These particular arcs correspond to a process within the data flow diagram and are thus named the same as the process itself.
- 3.3- Gives the number of the arc it relates to in a higher level diagram or an earlier data flow diagram within the project. In this case it refers to arc number 3 in lower level diagram #3 within the project.
- 8.4- Indicates that this particular arc is the #8 arc in the #4 lower level diagram of the project.

#### BATCH FILES

- INPUT FILES - The input file names are given the extension \*.IN.
- OUTPUT FILES - The simulation output files are given the extension \*OU.
- PRINT FILES - The print files have been given the extension \*.PR.

(This would allow subsequent updates of the input files to be numbered as IN1..., OU1..., PR1... etc.)

#### DEFAULT SETTINGS:

##### Control Record:

- (i) The output option selected is "O" which provides a detailed listing, and high level of summary information.
- (ii) The input record listing option selected is "O" which prints all input records.
- (iii) The composite terminal node output option selected is "16" which assumes family mode and intrafamily transfer of histogram data.
- (iv) The number of interactions used are "10" in the demonstration model to facilitate operation in the debug mode if required.
- (v) The composite node name and the network name are left as blanks.

- (vi) In the run identification the name of the corresponding Data Flow Diagram is used as identification for the network description.

**Arc Records:**

- (i) For each of the arcs the following records are provided:
- (a) Master Arc Record
  - (b) Time Distribution Satellite
  - (c) Cost Distribution Satellite
  - (d) Performance Distribution Satellite
- (ii) The Distribution Satellite Records are created to provide a uniform statistical distribution.
- (iii) The default values used for the minimum and maximum in each criteria are:

TIME	10.0	10.0
COST	10.0	100.0
PERFORMANCE	10.0	50.0

**Node Records:**

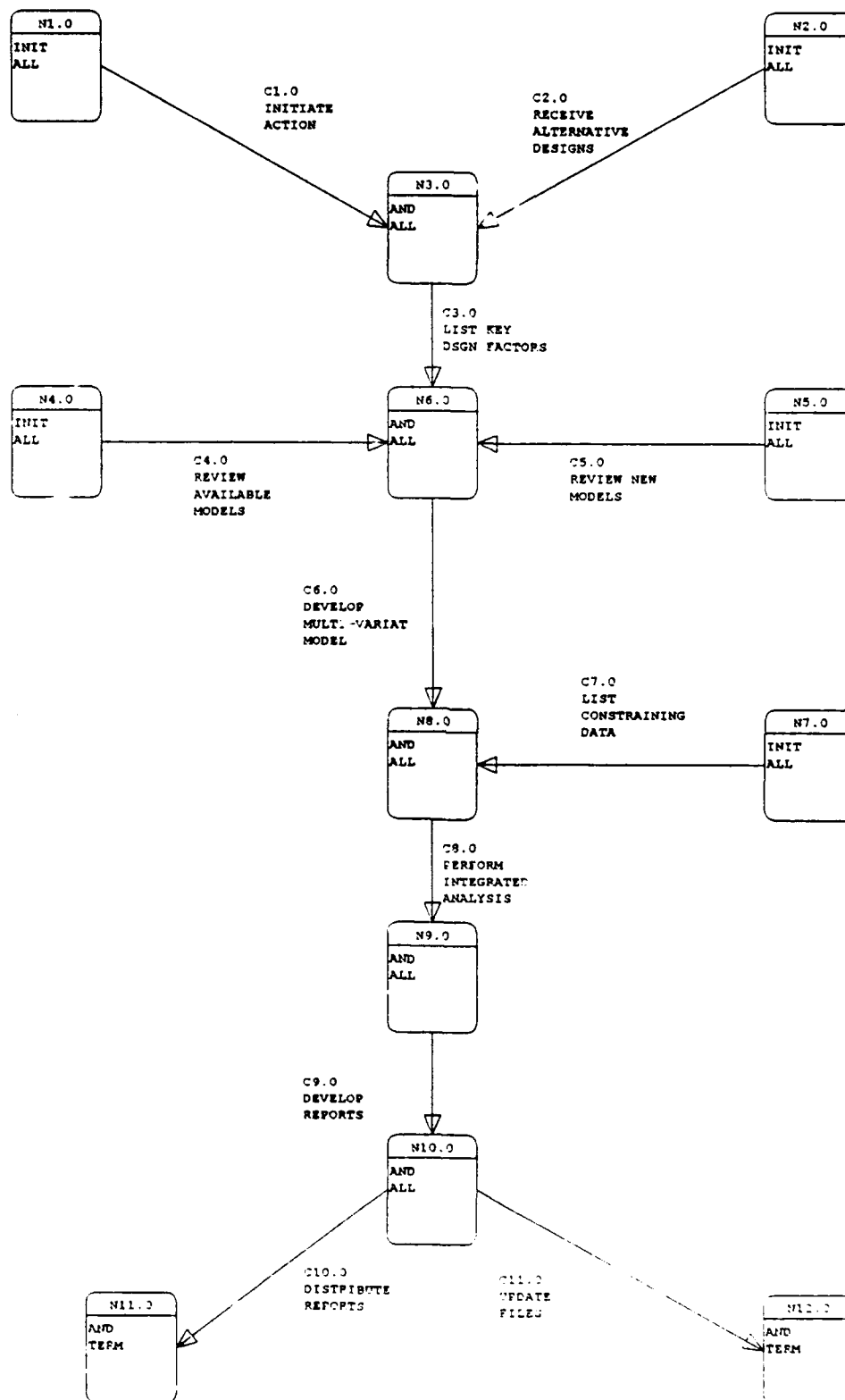
- (i) Input Logic - The input logic for the nodes are either "INITIAL" or "AND".
- (ii) Output Logic - The output logic has been defaulted to "AND" or "TERMINAL".
- (iii) The output option indicator and the storage option indicator are defaulted to read "O".
- (iv) The node description has also been left blank.

(It is again noted that the user can change the default values to desired values as identified by the particular requirement and applications.)

DOCUMENTATION:

With every project report APJ will be providing the following documents relating to the VERT:

- (i) A VERT network diagram corresponding to a particular data flow diagram.
- (ii) A print out of the VERT network inputs for the particular data flow diagrams.
- (iii) A floppy disc containing the sample input, print and the simulation output files for the default VERT network.



FORM 4 DEPT SATL  
Created by: JACE  
Revised by: JACE  
Date changed: 5-SEP-77

1 2 3 4 5 6 7 8  
 123456789012345678901234567890123456789012345678901234567890

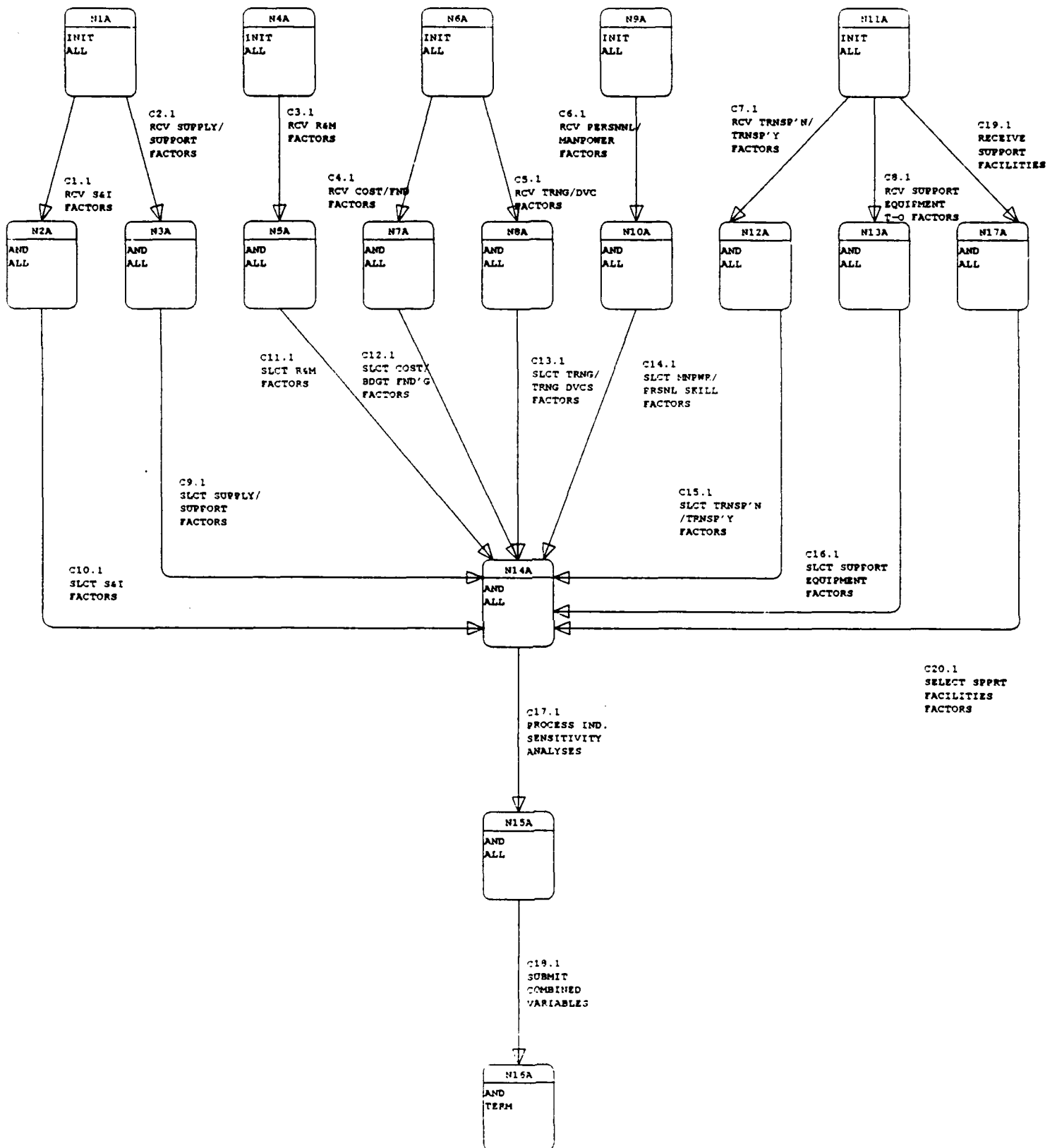
1. 0016 10

## READINESS SENSITIVITY ANALYSIS

	+	+	+	+	+	+	+	+
2. C1.0	N1.0	N3.0	1.0	INITIATE ACTION				
3. C1.0	DTIME 1		2	10.0	20.0			
4. C1.0	DCOST 1		2	10.0	100.0			
5. C1.0	DPERF 1		2	10.0	50.0			
	+	+	+	+	+	+	+	+
6. C2.0	N2.0	N3.0	1.0	RECEIVE ALTERNATIVE DESIGNS				
7. C2.0	DTIME 1		2	10.0	20.0			
8. C2.0	DCOST 1		2	10.0	100.0			
9. C2.0	DPERF 1		2	10.0	50.0			
	+	+	+	+	+	+	+	+
10. C3.0	N3.0	N6.0	1.0	LIST KEY DESIGN FACTORS				
11. C3.0	DTIME 1		2	10.0	20.0			
12. C3.0	DCOST 1		2	10.0	100.0			
13. C3.0	DPERF 1		2	10.0	50.0			
	+	+	+	+	+	+	+	+
14. C4.0	N4.0	N6.0	1.0	REVIEW AVAILABLE MODELS				
15. C4.0	DTIME 1		2	10.0	20.0			
16. C4.0	DCOST 1		2	10.0	100.0			
17. C4.0	DPERF 1		2	10.0	50.0			
	+	+	+	+	+	+	+	+
18. C5.0	N5.0	N6.0	1.0	REVIEW NEW MODELS				
19. C5.0	DTIME 1		2	10.0	20.0			
20. C5.0	DCOST 1		2	10.0	100.0			
21. C5.0	DPERF 1		2	10.0	50.0			
	+	+	+	+	+	+	+	+
22. C6.0	N6.0	N8.0	1.0	DEVELOP MULTI-VARIATE MODEL				
23. C6.0	DTIME 1		2	10.0	20.0			
24. C6.0	DCOST 1		2	10.0	100.0			
25. C6.0	DPERF 1		2	10.0	50.0			
	+	+	+	+	+	+	+	+
26. C7.0	N7.0	N8.0	1.0	LIST CONSTRAINING DATA				
27. C7.0	DTIME 1		2	10.0	20.0			
28. C7.0	DCOST 1		2	10.0	100.0			
29. C7.0	DPERF 1		2	10.0	50.0			
	+	+	+	+	+	+	+	+
30. C8.0	N8.0	N9.0	1.0	PERFORM INTEGRATED ANALYSIS				
31. C8.0	DTIME 1		2	10.0	20.0			
32. C8.0	DCOST 1		2	10.0	100.0			
33. C8.0	DPERF 1		2	10.0	50.0			
	+	+	+	+	+	+	+	+
34. C9.0	N9.0	N10.0	1.0	DEVELOP REPORTS				
35. C9.0	DTIME 1		2	10.0	20.0			
36. C9.0	DCOST 1		2	10.0	100.0			
37. C9.0	DPERF 1		2	10.0	50.0			
	+	+	+	+	+	+	+	+
38. C10.0	N10.0	N11.0	1.0	DISTRIBUTE REPORTS				
39. C10.0	DTIME 1		2	10.0	20.0			
40. C10.0	DCOST 1		2	10.0	100.0			
41. C10.0	DPERF 1		2	10.0	50.0			
	+	+	+	+	+	+	+	+
42. C11.0	N10.0	N12.0	1.0	UPDATE FILES				
43. C11.0	DTIME 1		2	10.0	20.0			
44. C11.0	DCOST 1		2	10.0	100.0			
45. C11.0	DPERF 1		2	10.0	50.0			
	+	+	+	+	+	+	+	+

	1	2	3	4	5	6	7	8
	1234567890123456789012345678901234567890123456789012345678901234567890							
1	NEW NETWORK				PAGE 2			
	1	2	3	4	5	6	7	8
	1234567890123456789012345678901234567890123456789012345678901234567890							
46. ENDARC								
	+	+	+	+	+	+	+	+
47. N1.0	1 2 0 0							
	+	+	+	+	+	+	+	+
48. N3.0	2 2 0 0							
	+	+	+	+	+	+	+	+
49. N2.0	1 2 0 0							
	+	+	+	+	+	+	+	+
50. N6.0	2 2 0 0							
	+	+	+	+	+	+	+	+
51. N4.0	1 2 0 0							
	+	+	+	+	+	+	+	+
52. N5.0	1 2 0 0							
	+	+	+	+	+	+	+	+
53. N8.0	2 2 0 0							
	+	+	+	+	+	+	+	+
54. N7.0	1 2 0 0							
	+	+	+	+	+	+	+	+
55. N9.0	2 2 0 0							
	+	+	+	+	+	+	+	+
56. N10.0	2 2 0 0							
	+	+	+	+	+	+	+	+
57. N11.0	2 1 0 0							
	+	+	+	+	+	+	+	+
58. N12.0	2 1 0 0							
	+	+	+	+	+	+	+	+
59. ENDNODE								
	1	2	3	4	5	6	7	8
	123456789012345678901234567890123456789012345678901234567890							





103.0.4.1A WEPT SA1A  
Created by: JACF  
Revised by: JACF  
Date changed: 10-12-80

1234567890123456789012345678901234567890123456789012345678901234567890

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## INDIVIDUAL SENSITIVITY ANALYSES

	1	2	3	4	5	6	7	8
2. C1.1	N1A	N2A	1.0	RECEIVE	STANDARDIZATION & INTEROPERABILITY FACTORS			
3. C1.1	DTIME	1	2	10.0	20.0			
4. C1.1	DCOST	1	2	10.0	100.0			
5. C1.1	DPERF	1	2	10.0	50.0			
6. C2.1	N1A	N3A	1.0	RECEIVE	SUPPLY/SUPPORT FACTORS			
7. C2.1	DTIME	1	2	10.0	20.0			
8. C2.1	DCOST	1	2	10.0	100.0			
9. C2.1	DPERF	1	2	10.0	50.0			
10. C3.1	N4A	N5A	1.0	RECEIVE	RELIABILITY & MAINTAINABILITY FACTORS			
11. C3.1	DTIME	1	2	10.0	20.0			
12. C3.1	DCOST	1	2	10.0	100.0			
13. C3.1	DPERF	1	2	10.0	50.0			
14. C4.1	N6A	N7A	1.0	RECEIVE	COST ANALYSIS/BUDGET FUNDING FACTORS			
15. C4.1	DTIME	1	2	10.0	20.0			
16. C4.1	DCOST	1	2	10.0	100.0			
17. C4.1	DPERF	1	2	10.0	50.0			
18. C5.1	N6A	N8A	1.0	RECEIVE	TRAINING & TRAINING DEVICES FACTORS			
19. C5.1	DTIME	1	2	10.0	20.0			
20. C5.1	DCOST	1	2	10.0	100.0			
21. C5.1	DPERF	1	2	10.0	50.0			
22. C6.1	N9A	N10A	1.0	RECEIVE	MANPOWER/PERSONNEL SKILLS AVAIL'Y FACTORS			
23. C6.1	DTIME	1	2	10.0	20.0			
24. C6.1	DCOST	1	2	10.0	100.0			
25. C6.1	DPERF	1	2	10.0	50.0			
26. C7.1	N11A	N12A	1.0	RECEIVE	TRANSPORTATION/TRANSPORTABILITY FACTORS			
27. C7.1	DTIME	1	2	10.0	20.0			
28. C7.1	DCOST	1	2	10.0	100.0			
29. C7.1	DPERF	1	2	10.0	50.0			
30. C8.1	N11A	N13A	1.0	RECEIVE	SUPPORT EQ./FACILITY CONCEPTS TRD-OFF FCTRS			
31. C8.1	DTIME	1	2	10.0	20.0			
32. C8.1	DCOST	1	2	10.0	100.0			
33. C8.1	DPERF	1	2	10.0	50.0			
34. C9.1	N3A	N14A	1.0	SELECT	SUPPLY/SUPPORT FACTORS			
35. C9.1	DTIME	1	2	10.0	20.0			
36. C9.1	DCOST	1	2	10.0	100.0			
37. C9.1	DPERF	1	2	10.0	50.0			
38. C10.1	N2A	N14A	1.0	SELECT	STANDARDIZATION & INTEROPERABILITY FACTORS			
39. C10.1	DTIME	1	2	10.0	20.0			
40. C10.1	DCOST	1	2	10.0	100.0			
41. C10.1	DPERF	1	2	10.0	50.0			
42. C11.1	N5A	N14A	1.0	SELECT	RELIABILITY & MAINTAINABILITY FACTORS			
43. C11.1	DTIME	1	2	10.0	20.0			
44. C11.1	DCOST	1	2	10.0	100.0			
45. C11.1	DPERF	1	2	10.0	50.0			

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NEW NETWORK								
PAGE 2								
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46. C12.1	N7A	N14A	1.0	SELECT	COST ANALYSIS/BUDGET FUNDING FACTORS			
47. C12.1	DTIME	1	2	10.0	20.0			
48. C12.1	DCOST	1	2	10.0	100.0			
49. C12.1	DPERF	1	2	10.0	50.0			
	+	+	+	+	+	+	+	+
50. C13.1	N8A	N14A	1.0	SELECT	TRAINING/TRAINING DEVICES FACTORS			
51. C13.1	DTIME	1	2	10.0	20.0			
52. C13.1	DCOST	1	2	10.0	100.0			
53. C13.1	DPERF	1	2	10.0	50.0			
	+	+	+	+	+	+	+	+
54. C14.1	N10A	N14A	1.0	SELECT	MANPOWER/PERSONNEL SKILLS FACTORS			
55. C14.1	DTIME	1	2	10.0	20.0			
56. C14.1	DCOST	1	2	10.0	100.0			
57. C14.1	DPERF	1	2	10.0	50.0			
	+	+	+	+	+	+	+	+
58. C15.1	N12A	N14A	1.0	SELECT	TRANSPORTATION/TRANSPORTABILITY FACTORS			
59. C15.1	DTIME	1	2	10.0	20.0			
60. C15.1	DCOST	1	2	10.0	100.0			
61. C15.1	DPERF	1	2	10.0	50.0			
	+	+	+	+	+	+	+	+
62. C16.1	N13A	N14A	1.0	SELECT	SUPPORT EQUIPMENT FACTORS			
63. C16.1	DTIME	1	2	10.0	20.0			
64. C16.1	DCOST	1	2	10.0	100.0			
65. C16.1	DPERF	1	2	10.0	50.0			
	+	+	+	+	+	+	+	+
66. C17.1	N14A	N15A	1.0	PROCESS	INDIVIDUAL SENSITIVITY ANALYSES			
67. C17.1	DTIME	1	2	10.0	20.0			
68. C17.1	DCOST	1	2	10.0	100.0			
69. C17.1	DPERF	1	2	10.0	50.0			
	+	+	+	+	+	+	+	+
70. C18.1	N15A	N16A	1.0	SUBMIT	COMBINED VARIABLES			
71. C18.1	DTIME	1	2	10.0	20.0			
72. C18.1	DCOST	1	2	10.0	100.0			
73. C18.1	DPERF	1	2	10.0	50.0			
	+	+	+	+	+	+	+	+
74. C19.1C	N11A	N17A	1.0	RECEIVE	SUPPORT FACILITY FACTORS			
	+	+	+	+	+	+	+	+
75. C19.1	DTIME	1	2	10.0	20.0			
76. C19.1	DCOST	1	2	10.0	100.0			
77. C19.1	DPERF	1	2	10.0	50.0			
	+	+	+	+	+	+	+	+
78. C20.1	N17A	N14A	1.0	SELECT	SUPPORT FACILITIES FACTORS			
79. C20.1	DTIME	1	2	10.0	20.0			
80. C20.1	DCOST	1	2	10.0	100.0			
81. C20.1	DPERF	1	2	10.0	50.0			
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82. ENDARC								
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83. N1A	1	2	0	0				
	+	+	+	+	+	+	+	+
84. N2A	2	2	0	0				
	+	+	+	+	+	+	+	+
85. N3A	2	2	0	0				
	+	+	+	+	+	+	+	+
86. N4A	1	2	0	0				

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87. N5A	2 2 0 0							
	+	+	+	+	+	+	+	+
88. N6A	1 2 0 0							
	+	+	+	+	+	+	+	+
89. N7A	2 2 0 0							
	+	+	+	+	+	+	+	+
90. N8A	2 2 0 0							
	+	+	+	+	+	+	+	+
91. N9A	1 2 0 0							
	+	+	+	+	+	+	+	+
92. N10A	2 2 0 0							
	+	+	+	+	+	+	+	+
93. N11A	1 2 0 0							
	+	+	+	+	+	+	+	+
94. N12A	2 2 0 0							
	+	+	+	+	+	+	+	+
95. N13A	2 2 0 0							
	+	+	+	+	+	+	+	+
96. N14A	2 2 0 0							
	+	+	+	+	+	+	+	+
97. N15A	2 2 0 0							
	+	+	+	+	+	+	+	+
98. N16A	2 1 0 0							
	+	+	+	+	+	+	+	+
99. N17A	2 2 0 0							
	+	+	+	+	+	+	+	+
100. ENDNODE								
	1	2	3	4	5	6	7	8
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## **ANNEX E**

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### **STRUCTURED SYSTEM ANALYSIS/DESIGN FUNDAMENTALS**

**ANNEX E**  
**STRUCTURED SYSTEMS ANALYSIS**

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**Fundamentals**

Structured Systems Analysis (SSA) has recently become an industry standard for generating Data Flow Diagrams (replacing "logic diagrams" or "flow charts") to aid in coordinating the functions to be performed by a computer program and its associated Inputs/Outputs (I/O). During the SSA, each set of "flow charts" can be checked by the potential user to assure that there is complete agreement on what is to be done by the program, and how it is to be accomplished. It also provides considerable flexibility for updating or changing the program.

Six basic elements ( see figure 1) are used in SSA:

1. Process (PRC)
2. Data Flow (DAF)
3. Data Store (DAS)
4. External Entity (EXT)
5. Data Flow Diagram (DFD)
6. Data Dictionary (DCT)

**PROCESS (Represented by a Circle):**

A function or operation to be performed which can be explained by a set of instructions representing a single task, e.g., "calculate interest on a loan", "prepare a draft report". If the Process description is too complex to describe in a few steps, it may be necessary to develop a lower level description (see below).

**DATA FLOW (Lines interconnecting Processes or I/Os):**

Each function or Process cannot be a stand-alone in a complex network. To have any meaning in a program, each process must be initiated by a previous action and/or provided information on which to act. Furthermore, a Process must result in an output which is the input to the next logical Process. These inputs, outputs, or initiating actions are identified as Data Flows, and are represented by the Data Flow lines indicating its point of origin and the process to which it provides data.

**DATA STORE (Represented by two parallel lines):**

Although some Processes generate data used as input to a succeeding Process, there is often a need to "gather or collect" information from files in which it is stored. This information may come from an external source (such as a MIL-STD, Army regulation, historical experience files, etc.), or an internal source or file in which data is temporarily stored for use by succeeding processes. These Data Stores can be visualized as a "file cabinet", in which the data are stored for later retrieval).

**EXTERNAL ENTITY (Represented by a Rectangle):**

Each program or logical process must have an initiating action, a "point" of disposition of the results, and possible input guidance or instructions. Each of these have authorities, functions, or applications which are independent of the program Process (although required by the program Process). Thus, these activities, agencies, or facilities are considered "External Entities" to the program.

**DATA FLOW DIAGRAM:**

The general arrangement of the above can be readily seen. First, the circle or Process describes what has to be done; the interconnecting lines represent the Data Flows, together with the specific description of all I/Os. The Data Stores identify the source and/or file designation of a data base, and the External Entities represent those activities remote from the Process, which are the source of guidance or the recipients of the program. This combination of Processes, Data Flows, Data Stores, and External Entities constitutes a "Data Flow Diagram". The unique feature of the Data Flow Diagram (DFD) is that each process can be considered independently, permitting a change to be made in one Process without a major change in the overall program.

**DATA DICTIONARY:**

The Data Dictionary consists of a complete description of each of the basic elements. For the Process, it contains a step-by-step description of what has to be performed. The description of the Data Flow identifies the nomenclature of the data, a detailed description of its content, and its source. The Data Stores and External Entities are described, including possible location.

The Data Dictionary (a living document) begins with a description of the first Process and is continually built-up as the Data Flow Diagrams are expanded, detailed, and eventually completed.

#### **APPROACH TO PERFORMING STRUCTURED SYSTEM ANALYSIS:**

The best approach to Structured Systems Analysis is to assume that the program consists of a series of processes, each of which are to be assigned to an inexperienced analyst. Each analyst is to be walked through the assigned process of the Program, explaining step-by-step what functions have to be performed or what actions have to be taken to accomplish the process. The analyst is also informed where the information is coming from (input Data Flow), what is to be generated by each process (output Data Flow), where the data base may to be found (Data Stores), and who to contact for guidance (External Entities).

The best way to initiate a SSA is to set down the point of origin of a program, its final goal(s), and the intermediate functions or actions needed to get from beginning to goal. Each step should be considered as a Process - some may be sequential and others parallel. Then, the steps needed to accomplish the Process should be described. If the description is complex and needs intermediate steps, the Process is then a candidate for an "explosion". That is, the top (or upper) level Process is considered as a "project" and its own Data Flow Diagram is prepared.

When writing the step-by-step procedures in the Process, certain elements of data (or information) must be made available for the procedure. Each element of data is considered as an input Data Flow, which is identified and described. The product (or result) of a Process is an output Data Flow element.

Each Data Flow to the Process must originate from:

1. an earlier Process
2. a Data Store (or file)
3. an External Entity.

These sources are also identified, described and put into the Data Dictionary. As soon as the last portion of the Data Flow Diagram has been described, the SSA is complete.



The Structured Analysis phase is followed by Structured Design, then by programming and finally, software test and validation. The organization of Structured Analysis and its relationship to Structured System Design is shown on Figure 2.

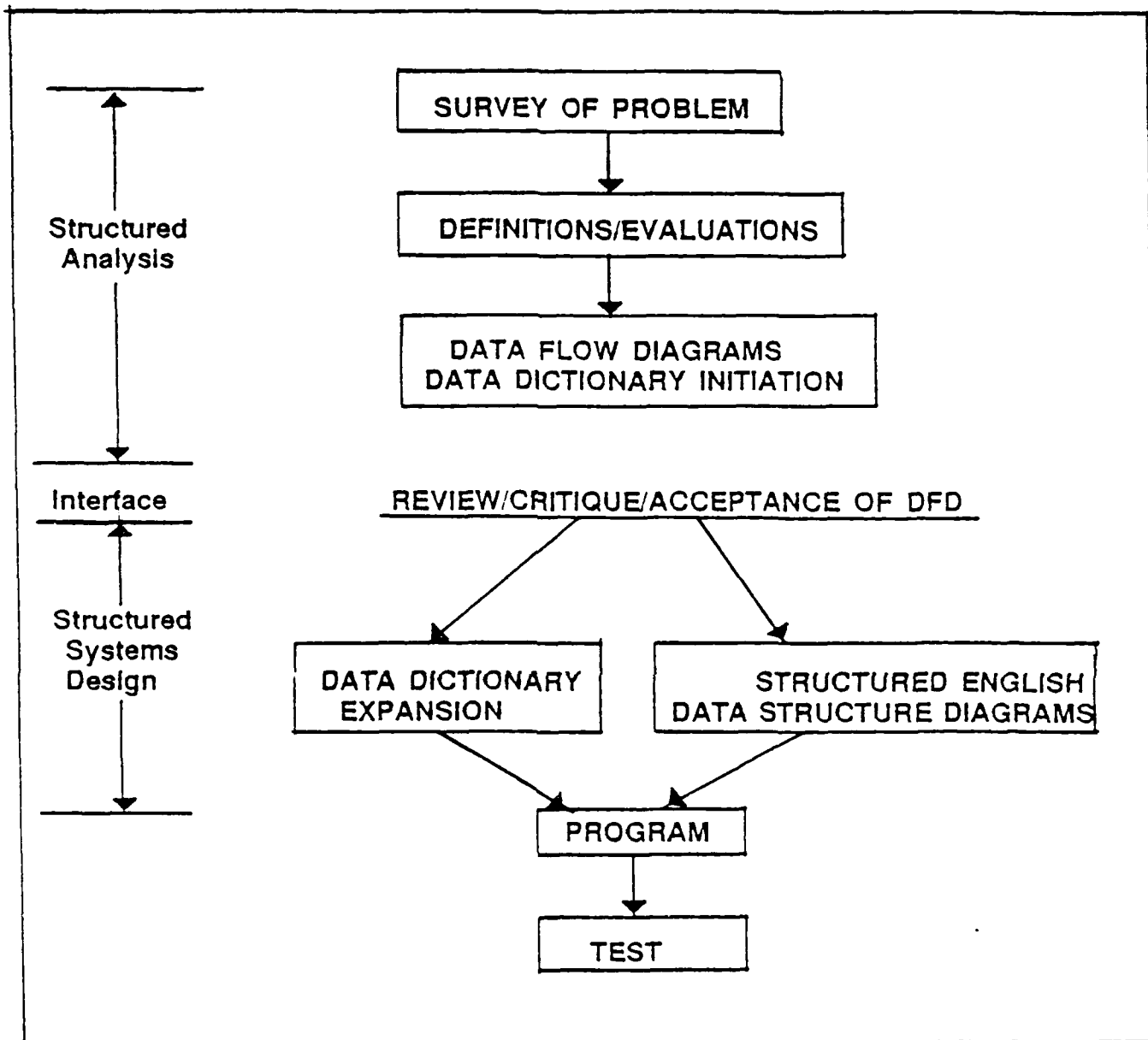


Figure 1. Structured Analysis & Structured Systems Design Organization

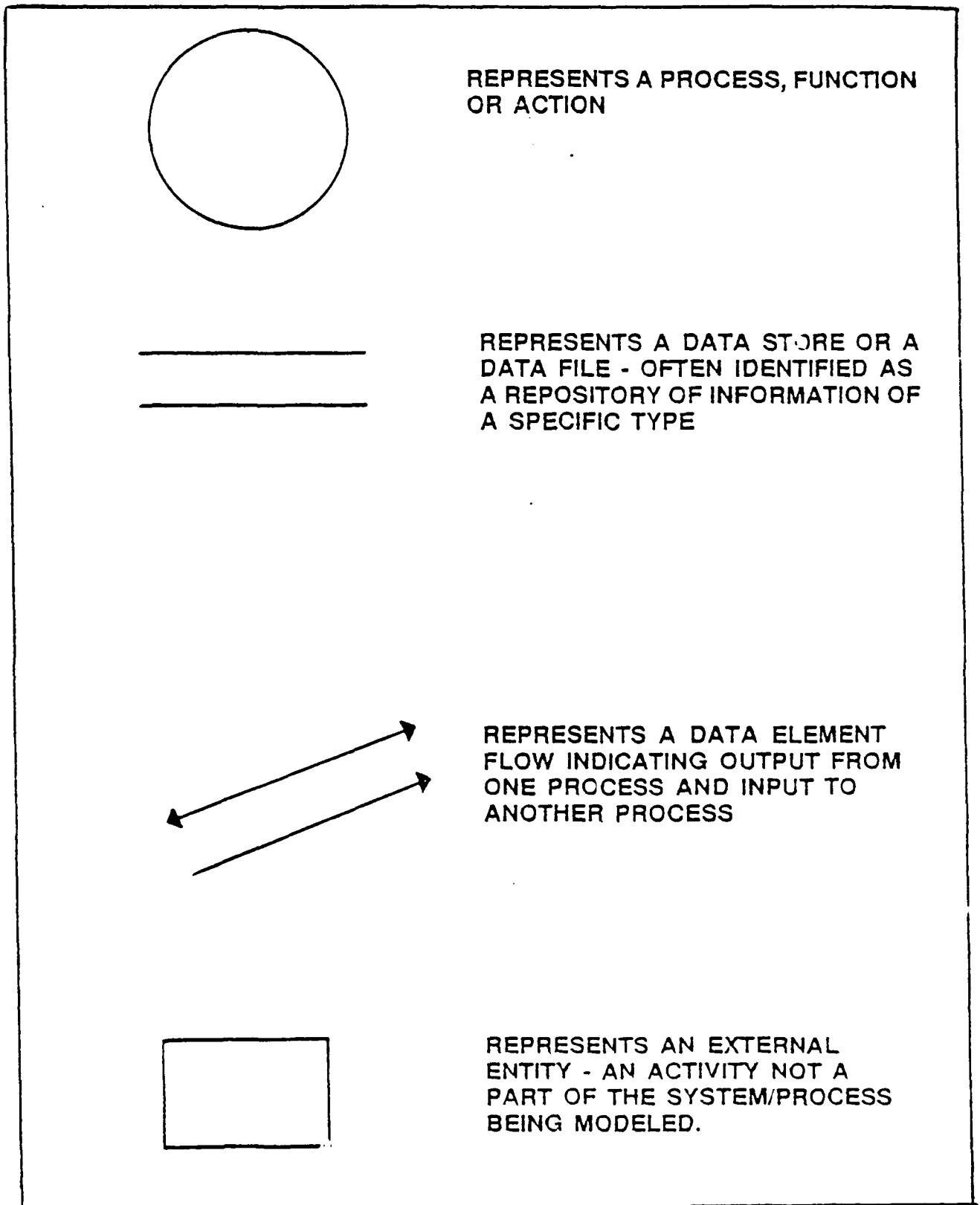


Figure 2. Standard DFD Symbol Definitions



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